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Abalones and Their Pearls

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LET us look back, far back, into the dim and distant past and imagine a pair of strange, wild beings searching for food among the rocks of the seashore. A shell is opened and there, embedded in the flesh of the mollusk, lies a round, bright object of exquisite beauty. It is a pearl, and naturally it becomes a prized possession of the lucky finder.

Since the dawn of history, pearls have been a source of joy and wonder to the human race. They were found in the tombs of the Egyptians; in the burial-places of some Indian tribes of the southeast, and in the mounds of the Mound Builders. A thousand years ago they were used for decorative purposes in Japan, and large abalone pearls are found in images of Buddha made in the year 300.

The pearl rightfully has been called "The Queen of Gems." It does not flash and glitter like the diamond, and no matter how bright the color, there is about it a certain modesty that causes it to be considered the criterion of good taste. Pearls may be worn at any time. The outstanding characteristics of a fine pearl are its perfect shape, its subdued luster, and its iridescent loveliness. While there are many kinds of pearl-bearing mollusks and many classes of pearls, the finest and most valuable are the best among the oriental pearls, fresh water pearls, conch pearls, and abalone pearls. Some other classes have a certain amount of beauty but are considered to be of less value.

Fossil shells of the *Haliotis* or abalone have been taken from rocks of the Pleistocene period at Faults Bay near San Diego, California. There has been little or no change in their form or characteristics during millions of years. Man's wonder and love for the pearl also have survived through the ages.

Ear-shells or abalones, Haliotidae, occur in the coastal waters of California, Japan, New Zealand and other

ABALONE ROCKS, LA JOLLA, CALIFORNIA
The favorite home of the abalone is the underside of a rock ledge below the pounding surf.
PHOTOGRAPHS BY E. C. LAFOND

AN ABALONE AND ONE OF HER TEN THOUSAND CHILDREN
Note the series of holes in the shell for the admission of water to the respiratory organs

localities in the Pacific. A few are found along the Atlantic shore of France. During 1920, in the course of dredging for ocean life off the eastern extremity of Cuba, one small abalone was obtained. It appears to have been the only one reported along the eastern coast of the Americas. It is supposed that during bygone days when there was a water connection between the Atlantic and Pacific over what is now Central America a few adventurous abalones worked their way eastward and the species managed to survive in diminutive form. The specimen obtained was small and at a considerable depth where the water was cool. Abalones prefer cool water. That is one reason why the largest and finest in the world occur along the western shores of North America—where the Japan Current, chilled after skirting Alaska, swings along our coast.

The largest variety, *Haliotis rufescens,* commonly called "red", is most abundant between Ft. Bragg, California, and Santa Barbara; *Haliotis fulgens,* "green", between Santa Barbara and San Diego; *Haliotis cracherodii,* "black", from Los Angeles south and along the Mexican coast. Among other varieties is *Haliotis corrugata,* "pink", which occurs to some extent among the others but usually in deeper water.

As might be expected, the younger and therefore the least sophisticated abalones may be found near shore, where they become the prey of wandering bands of tourists. Older and wiser ones prefer to cling to rocks at greater depths. They like to live beneath submerged ledges or hide in crevices where wild waves break. There is considerable pleasure in diving for large abalones.

Abalones are univalves—a variety of snail. The shell resembles an inverted, bowl-shaped roof which protects the creature within. It is somewhat lengthened in form and its curious whorls and markings remind one of the human ear. An outstanding characteristic is a regular series of holes in the shell near the distal margin for the admission of water to the respiratory organs and for other purposes. These apertures extend along the left side and parallel the columellar lip. As the shell increases in size the holes nearest the apex close one by one and others form at the anterior edge.

While the exterior of the shell is usually rough and coated with various marine growths, the interior is of exquisite loveliness. The inner lining is so wondrously tinted that it looks like a fairy's home. It is smooth and lustrous, in bright greens, brilliant blues, and fawn-yellows, shot through with flame-like, iridescent reds. However, this delicately beautiful shell is not, as one might imagine, the nest of a fairy—it is occupied by a homely mollusk. Occasionally, one of these lowly creatures owns a marvelous pearl. It is a sad fact that the pearl is not a prized possession but a certain sign of trouble.

When a foreign substance drifts into the shell and cannot be ejected, it causes discomfort and the irritation forces the mollusk, as a means of self-protection, to secrete around the intruder a fluid that, in time, hardens and becomes a layer of pearly nacre. As layer after layer forms the size of the pearl increases. If pressure from the growing pearl becomes too strong the creature may die, but it is more likely that the "pearl sac" will be ruptured and the pearl lost. This is one of the principal reasons why few large, fine pearls are found. The writer was for several years a professional pearl buyer, visiting the "shelling camps", and has heard of instances when good-sized pearls were discovered in shallow waters near shore, after having been freed by death or abortion.

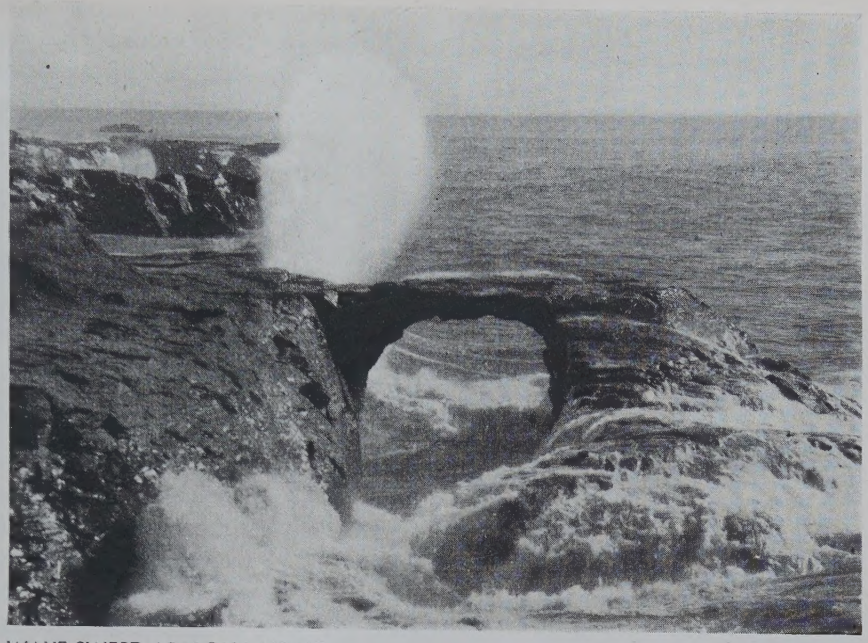
Few large, well-formed pearls are found in any kind of mollusk and with abalones such pearls are especially rare. The majority are small and the larger ones are usually ill-shaped, but "once in a blue moon" an abalone mothers a fine pearl of 75 grains. One of the outstanding abalone pearls to reach world renown was owned by the great actress, Madame Nordica. It weighed 175 grains and was used as the central drop in her wonderful necklace of American pearls.

Since the nacre of abalones is superior in quality to that of other mollusks; since large, perfect abalone pearls are almost never found; and since the coloring is exceptionally fine it would seem that they should head the list of precious gems.

Because of their extreme beauty and brilliance some of the oddly-shaped abalone pearl growths are utilized in art creations of butterflies, humming-birds, beetles and

dragon-flies, and the like. These can be made in bright greens, iridescent reds, peacock colors, or robin's-egg-blue. Small Hungarian fire opals are used for eyes. This class of jewelry gives the highest artistic effect and is of exceptional beauty.

The shape of a growing pearl is determined by its location in the anatomy. If in contact with the shell, it will become attached. If muscular or organic movements exert pressure upon it, the layers of soft secretion will be shaped accordingly. Such movements may cause the pearl to assume the shape of an egg, barrel, or acorn. Various forms occur because the movements turn the growing pearl somewhat as if it were in a lathe—the principal difference being that the pearl increases in size with each successive layer secreted around it.



WAVE-SWEPT ABALONE HOME

Abalones can be found in such places as this—if you care to dive beneath the surface to get them

As a pearl grows, it is possible for an expert to "peel" off flaws or imperfections if they are not too deep. While a pearl may be bettered in this manner, it is well to remember that fine pearls are sold by weight and the larger the pearl the more it is worth per grain.

Orville Rittenhouse, a professional "pearl peeler" of Muscatine, Iowa, owned a perfectly-shaped pearl top that would spin on a glass show case. The writer has in his collection of oddly-shaped pearls two "barrel pearls", perfect in every way, even to the hoops. He also has three "snail pearls" that in form exactly simulate the exterior of a snail shell.

Abalones attach themselves to surf-swept rocks by means of their muscular, disk-shaped foot, which exerts considerable suction in the manner of an exhaust-cup. When the tide is low, fishermen secure them by wading in the water and prying them from the rocks. A leaf from an automobile spring is best for the purpose. Choosing a moment when the abalone is slightly relaxed, the piece of spring is deftly inserted between the shellfish and the rock. A quick jerk loosens its grip. If startled, the abalone will clamp down tightly, in which case it can only be removed by breaking the shell. A good-sized abalone can exert tremendous power, and it is dangerous to slip the fingers under its shell.

As abalone shells are of exceptional beauty they are utilized to advantage in the manufacture of toilet articles and novelty jewelry. In Japan the prettiest parts of the shells are reduced to thin layers and then used for inlaying work or marquetry.

The immense foot muscle is composed of white meat and is much esteemed as food. Abalone steaks are listed on the menu cards of many of the best cafés and hotels of California. Abalone meat in vast quantities was formerly shipped to both China and Japan but the supply has become depleted and the industry ruined. This is another reason why large, fine abalone pearls are almost never found.

It has long been the practice of some jewelers to sell what are known as "abalone blisters" which are merely the result of endeavors on the part of the mollusk to bridge over and fence away a boring parasite that is coming through the shell. This is done by secreting pearly nacre over the spot where the intruder is trying to gain entrance. A blister may also be formed over a foreign substance that lies next to the shell and later disintegrates, leaving a hollow layer of nacre. As these blisters became scarce some ingenious person began cutting out rounded bits of shell and these were widely sold as "abalone blisters" and, to the unsophisticated, as "abalone pearls." This has been a rank imposition. Abalone blisters are hollow. "Attached pearls" are solid but grown fast to the shell. Some of the latter have great beauty on the side that has contact with the flesh of the mollusk and are highly prized for mountings and for costume jewelry. The finest and most perfect pearls grow in a "pearl sac" in the fleshy parts of the mollusk.

In the year 1897 experiments in abalone pearl growth were made by Louis Bouton, an account of which was given at the Paris *Académie des Sciences* in 1898. He inserted pellets of mother-of-pearl through holes bored in the shell. In this manner the pellets were so placed that they were between the inner lining of the shell and the mantle. As might have been expected, the result was an imperfect partial covering of nacre but it was of course impossible to secure proper pearl growth by a means so crude. About 1920 a resident of Los Angeles by the name of Oliver experimented extensively but did not solve the problem.

Dr. George Kunz, gem expert for more than forty years with Tiffany, once told the writer that it was his

THE MADAME NORDICA COLLECTION

The Nordica drop pearl, an abalone pearl weighing 175 grains, was found off the coast of southern California

opinion the time might come when there would be a large and profitable business in growing pearls in the abalones of the California coast.

When abalones reach adult size they select a favored spot on a submerged rock for their home. The location most desired is either a slight hollow in the stone or the under side of a ledge. Some crawl into deep crevices where, attached to one rock and with their backs against another, they defy attempts to dislodge them.

If kept in laboratory tanks there should be a constant flow of fresh ocean water, properly aerated. If there is insufficient oxygen in the water, the abalones may creep up the sides of the tank and remain above the water line until exhausted, then fall back and die. A suspended water-dump that empties into the tank about once each minute will supply the right amount of oxygen and also simulate the wave action to which abalones are accustomed. It is well to remember that it is natural for them to live where waves slap against the rocks.

Some curious habits of abalones have come to the attention of the writer while studying them along the coast and in his laboratory tanks. Their food consists of microscopic animal and vegetable life and also of eel-grass, sea-moss and kelp. If a piece of kelp is held in front of an abalone, it will sometimes jump for it a distance of a couple of inches. They will fairly leap at and devour with gusto a little red sea-worm known as *Thoracophelia.*

Pearls are thus shown to be among the most prized as jewels, their beauty and value having been recognized by many peoples since earliest times. Many considerations seem to place those produced by the abalone high in the scale of desirability and, since the species that produces them is relatively limited in range and is already growing scarce, it would seem that abalone pearls stand little chance of losing their supremacy.

Life's Shopwindow

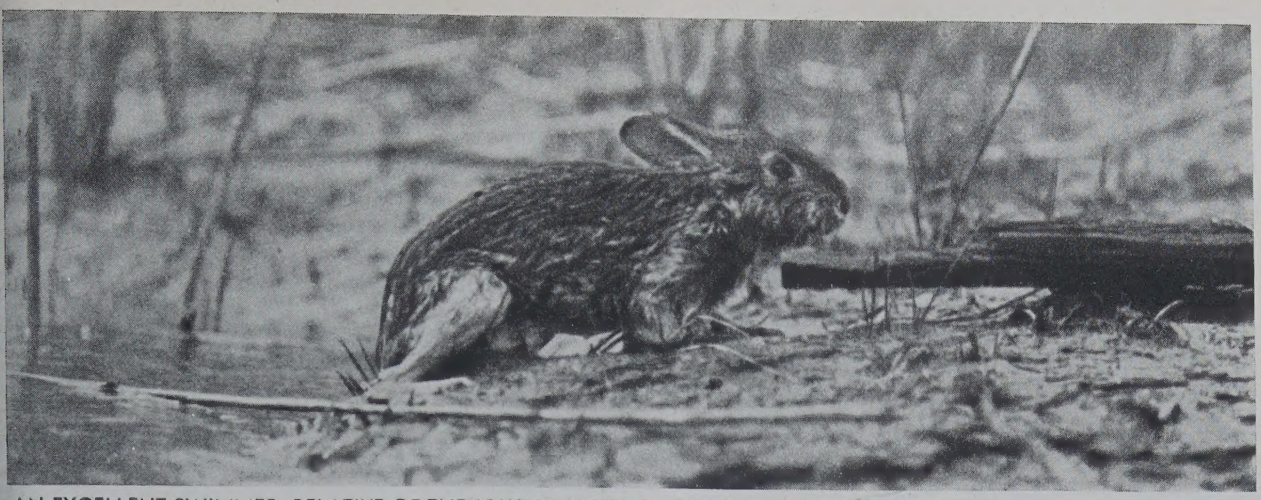
By ADA CLAPHAM GOVAN

AFTER a day's shopping in the midst of the noise and confusion of the big city, with weariness overcasting my spirit and tugging at my feet, I invariably sought out a certain jewelry shop just to gaze at the pageantry of color behind the plate glass window. It wasn't that I coveted the riches I saw; I reveled in the life and beauty that the sunbeams wrung from cold, inanimate stones.

Years have passed since I last stood before that shrine of beauty. In these less kindly days, a fairy godmother must have seen my sore need and woven a magic spell about my shut-in world. For in my own home I have discovered another window wherein I again find solace for the ills of body and spirit; a window that looks out upon a pageantry of such exquisite beauty as makes a tawdry thing of that glittering display of long ago. The colors are kissed into being by sunbeams that linger lovingly on warm bodies pulsating with life and happiness; I had thought cold, lifeless stones the most exquisite things on earth but that was before the creation of my Backyard Kingdom—before I had learned to really see the marvelous beauty of a feather.

The other day two purple finch lovers stopped for a while upon my windowsill, and one was a gorgeous crested Knight and one was a small dusky maid. Olive-bronze from head to tail, she seemed so drab a lass to mate with such complete and fiery beauty. Later, I could well understand that it was not Love's eyes that were blind; the unseeing eyes were mine. For I finally trapped the pair and I banded the wine-clad Knight but the little lass I did not need to band—she already wore the shining anklet that had made her mine in her babyhood. So I only stroked her head and touched her warm sleek throat and then I begged her pardon most humbly. I had discovered in my nut-brown maid a Lady born to the purple!

Below a silky patch of creamy white beneath her chin, a tiny spangled necklace hung daintily upon a darkly striped breast. Spread out like a sunburst lay a crescent of fine dusky feathers tipped (Continued on page 377)



AN EXCELLENT SWIMMER, RELATIVE OF THE BRUSH RABBITS OF CENTRAL AMERICA

Perfectly at home in the water, the marsh rabbit seeks a cooling pond to escape insect pests as well as other enemies

AN AQUATIC RABBIT

By IVAN R. TOMKINS

OF ALL wild animals, the rabbit is by far the best known. Every boy who lives in the country becomes acquainted with it and knows its habits well. To most of us the word "rabbit" brings up thoughts of a white tail bouncing along the path in the gathering dusk, but in the low-lying lands of the southeastern states it often refers to a shy, short-legged animal that lives in dense thickets, "scoots" instead of bounces, and does not own a conspicuously white tail. This is the marsh rabbit.

The well known cottontail, which in its many forms lives scattered pretty well over the United States, is believed to have originated in this country. But the marsh rabbit, and its close relative, the swamp rabbit, we suppose to be more closely related to the brush rabbits of Central America, and to have come into our country from that region.

The marsh rabbit ranges along the coastal plain from the Dismal Swamp to Texas, while the longer-legged swamp rabbit occupies roughly a triangle from southwest Georgia to Texas and up the Mississippi River system to southern Illinois.

The marsh rabbit lives with the rice rat, the rails, gallinules, and the herons for neighbors, plus the raccoon, mink and otter—which may not be so neighborly. His home, usually, lies within dense thickets of grasses and sedge that from a rabbit's view must seem like a forest. Interspersed are deep bogs, and creeks meander through, swelled by flood tide and drained by the ebb. For many months the rabbits are protected from overhead enemies by this overarching cover. At night they emerge to cut capers on the sand, leaving for us a maze of tracks to decipher, or thread through the open bogs and swim the creeks or breakwaters where alligators lie in wait.

In a world where all must either swim or fly, or else perish, the rabbits swim with ease. Being largely nocturnal, probably they swim much more at night than during daylight hours. In this way they escape the hordes of insect pests. The otter, mink, and raccoon have thick skins with every crevice filled with fat cells, but the thin-skinned rabbits are not so protected against the cold and prefer not to swim in winter, mild though the winters are in their territory.

It is quite a common thing to find one swimming out in the river, and Dr. John Bachman, who nearly a hundred years ago first told the world of this interesting animal, kept one in captivity that enjoyed lying in a pan of water much of the time.

One Christmas Day I found one swimming along the brick wall of an old fort at the river's edge. I headed it off several times with my bateau, and it finally turned and swam straight to my boat. I picked it from the water and put it inside. It scrambled at once far up into the bow, and did not try to get away on the trip home. There it was placed in a chicken crate with a Christmas dinner of lettuce, and that night allowed to go free.

Few naturalists have seen the nest of this species, because of its location in such thick sedge and because of the attending hordes of flies and mosquitoes that in summer make life in these marshes intolerable for humans. There is also the danger of stepping on a cottonmouth moccasin. The grasses grow green by mid-winter and soon are waist high, concealing well all the activities of the small mammals residing there.

A nest found in late February was in a bit of sedge that had been burned over; otherwise, it would have passed unnoticed. It was made of the softer grasses mixed with quantities of rabbit fur. It had been used some time, and if the rabbit fur had been originally placed there as a lining, it now was well mixed throughout. It seemed as though all the rabbits in the vicinity must have con-

tributed to the nest, but most likely it was all from the mother's breast.

In it were three young ones. Probably the bright glare of the sun was uncomfortable, used as they were to coming out only at night. They had tramped down the inch deep floor of grass and fur until it was packed solid. I had to hold them to get a photograph, and it was not easy to hold the squirming rabbit far enough away and look into the camera hood at the same time. They were funny gray little animals, with dull-colored and pointed tails, and were much smaller than a cottontail of the same age.

Go in summer to any place where this species is common, and at dusk you may be greeted with a peculiar snort, high-pitched and nasal. This, with no contrary evidence, I suppose to be a warning signal from the mother to her young. It may be heard in winter too, especially at night.

It may seem strange that two animals so far removed structurally as deer and rabbits should have developed the habit of stamping with their feet as a warning to others of their kind. This habit, however, is one that has been adopted by many groups of animals the world over, and among those inhabiting many widely varying environments. In some groups the hind feet are used for signaling, in others the fore feet. It would seem, therefore, that the habit harks back to long-past eras in the development of mammalian characteristics. Here in the swamp country both the deer and the swamp rabbits, and some

THE MARSH RABBIT IN ACTION
He swims with ease and rapidity, striking out with alternate motions of the feet

of the small mammals also, signal their warning or annoyance in this way. But the deer (as do also sheep and probably all other ruminants) employ the front feet; the rabbits, the hind ones.

The present species is no exception to the general rule of the rabbit kind. I have heard them stamping frequently when the animals were on firm ground. These young ones, scarcely ready to leave the nest, already knew the trick, for while I was getting the picture of one, I put the other in the camera box, where he thumped away the whole time I was photographing his brother.

A SQUIRMING YOUNGSTER
The author was forced to use a restraining hand to get this lively fellow's picture

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Featured in the July issue of Nature Magazine will be "Birds of Chinese Tradition," a most interesting article on the position held by birds in the mythology of the Far East. The article was written by John W. Maloney, a newspaperman who has spent time in China and has interested himself in Chinese art. Amateur scientists whose hobby is seeking the minute in Nature with their microscope will be especially interested in an article by Julian D. Corrington entitled "Argus Eyes Under the Microscope," in which he shows that the eyes of insects run the gamut from total absence to the extreme in complexity. An entertaining article on the burrowing owl as he found them in central Florida has been written by Hugo H. Schroder, and an insight into the carnivorous activities of the Venus flytrap is presented by E. V. Deans, Jr.

"WAKE UP, TOMMY, IT'S TIME TO EAT!"

One of the linnet's favorite pastimes was tugging at the whiskers of the tom cat while the latter was asleep. The story of the remarkable friendship that grew between these two supposed enemies is told in the accompanying article

A Prison Friendship

THE CHARACTER of one's environment is a most important factor in molding human conduct. But even the close association of wild creatures, especially carnivores, with human beings, unless continued through many generations, is not likely to effect important changes in their mental characteristics. Humans try to raise tiger cubs, baby wildcats and many other wild animals as pets. The environment of a comfortable home with plenty to eat has little effect, though, for, sooner or later, most of these animals have to be turned over to the Zoo because they develop unruly traits.

The docile house cat is one of the bird's deadliest enemies. On occasions the lady of the house has returned from a downtown shopping trip to find the door of the canary cage open and her cat snoozing comfortably on a full stomach. Cats and birds have been at claw's points down through the ages, paralleling the animosity existing between the spider and the fly, the Democrats and the Republicans and pickles and ice cream.

It's the exception to the rule that is worthy of attention. Study the picture of the bird tugging at the whiskers of the sleeping cat. These two creatures are "inmates" of the California State prison at Folsom. Both pictures were furnished us by Court Smith, warden of the prison. Warden Smith had requests for them from all parts of the United States, as well as from an Italian lady in Naples. Sending the pictures, the warden writes:

"The cat was born in penal servitude and, as you can see by the photos, is entirely unconcerned over his 'life jolt.' Our inmate photographer—a Japanese—has raised him from a kitten. Somehow he has grown up without developing any of the usual instincts of a normal tom cat. He seems to have no family entanglements, and is content to while away his time drowsing around the photo gallery and print shop, where he has been taught birds are to be admired and not devoured.

"The bird, a linnet, was raised by a peg-leg Italian who works in the print shop adjoining the photo gallery. He has a large cage of these birds and all his spare time is devoted to their care.

"Shortly after this particular bird was hatched, his mother decided to reline her nest. In doing so, she carelessly overlooked the fact that her baby was in it. She started building another layer right on top of him. He had no feathers and this rough treatment nearly caused his death. The Italian was horrified, so he snatched the youngster out of the cage and revived him. Each night after that he carried the bird with him to his cell, kept him warm in his own bed, and stayed awake to feed him with an eyedropper. The linnet grew and became strong,

but he never went back into that cage. He was content to live in the print shop. The treatment he had received since leaving the cage had convinced him he was mixed up with a pretty good crowd, so he had no instinctive fear of the cat. Their acquaintance developed into a real friendship, as you can see by the pictures. It is amusing to see the linnet ride around on the cat's back or pull his whiskers when he is asleep."

Environment again. Neither creature knew the companionship of his own kind, but when thrown together in "solitary confinement" accepted each other's trust and became close and understanding friends.

LIFELONG FRIENDS WITHIN MAN'S PRISON WALLS

Born in "penal servitude," neither creature has any instinctive animosity toward the other. They eat and sleep together, and thus violate one of Nature's oldest laws

Anderson's Shield Fern

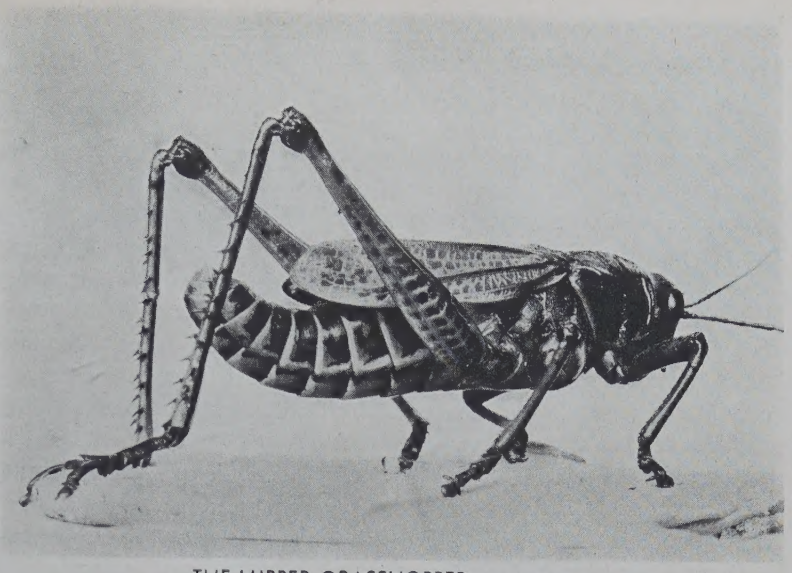
By W. H. HIGMAN

ONE of the most interesting ferns in the Cascade Mountains of Washington is Anderson's shield fern, *Polystichum andersòni.* Though generally considered rare in our most northwestern State, this fern is really widely distributed in the mountains. It is even abundant in certain localities. Its favorite habitat appears to be among moss-covered boulders in the alder and maple thickets that margin the avalanche-swept rock slides. When it first appears in spring it is as gray as a willow catkin, and gives no promise of possessing that exquisitely crisp delicacy of outline, which, combined with the distinct green of its coloring and the graceful carriage of its fronds, makes the mature plant easily the most beautiful of the northwest coast ferns.

PIANOS FOR EARS

Microscope reveals hearing organs of insects

By JULIAN D. CORRINGTON



THE LUBBER GRASSHOPPER
A "short horn" or true locust, a desirable species for studying the hearing organs of this group

NO ONE really appreciates the value of a sense of hearing nor realizes how much we depend upon man's most complicated and highly protected of all organs—the internal ear, seat of sound perception. And yet, out of the whole array of animals on earth, only the vertebrates and a few insects have structures that could be termed ears, though vibrations in either water, soil or air can be detected by sensitive nerve endings in perhaps the majority of animals.

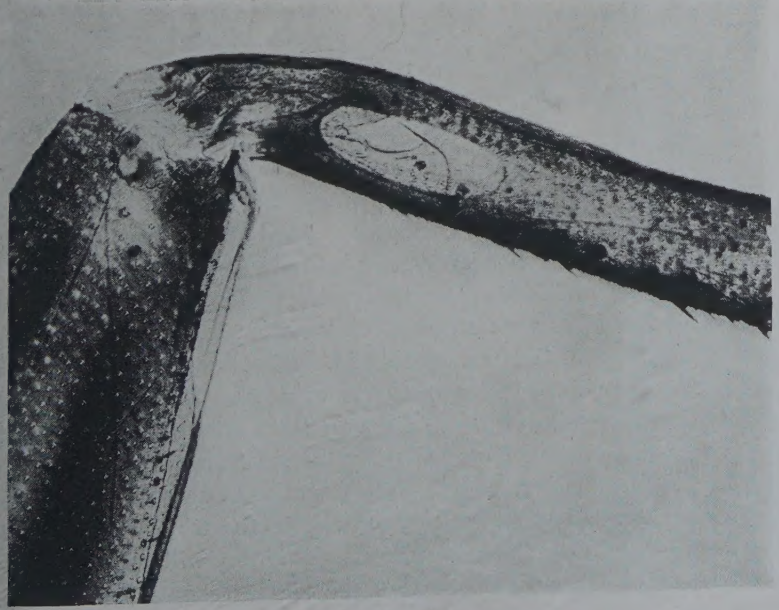
It is generally assumed that most insects "hear"; that is, pick up sound vibrations by means of specialized nerve endings in their feelers, more properly termed the antennae. But some of the group known as the Orthoptera, including the roaches, grasshoppers, crickets, mantis and walking sticks have much more definite and recognizable hearing organs, to which the name "ear" is generally applied. Two examples will suffice as subjects for study by the owner of a microscope.

The next time you're out in the field, collect a number of grasshopper-like creatures and note the relative length of the antennae as compared with the body length. Those in which the antennae are shorter than the body are the "short-horns" or true locusts, a name which has been wrongly applied to the cicadas, including the seventeen-year "locust". Those with antennae longer than the body are the "long-horns" or true grasshoppers. Crickets, also with antennae longer than the body, have to be distinguished on more technical characters, though nearly everyone is familiar with the common black species.

Back again in your laboratory, examine several of the largest specimens of both locusts and grasshoppers under low power or with a hand lens. Perhaps you have been agile or crafty enough to catch one of the "bird locusts", such as the Carolina locust, those big fellows that startle you with their loud crackling noises. They may easily be distinguished by their black wings with the yellow borders. In the south, the huge and flightless lubber grasshopper is a desirable type, especially the yellow variety. Among true grasshoppers, the katydid is by far the preferred species. Lacking any of these, smaller and more ordinary species will serve.

Note that the body is divided into three main sections: the head, with its eyes, antennae and mouth-parts; the thorax, bearing three pairs of legs and two pairs of wings; and finally the abdomen, which is segmented and without appendages. On the sides of the first abdominal segment or division there is a pair of small openings, one on each side, similar to those appearing on the other segments of the abdomen. These are spiracles, the inlets for air used in breathing.

Near the spiracle, on the first segment only, and much larger in size, is the tympanic membrane or ear drum. This cov-



THE CRICKET'S EAR
The light-colored oval object is the hearing mechanism of all "long horns." It is in the second long section of each foreleg

ers a sac or depression, generally conceded to be the organ of hearing, as it is lined with sense cells from which a large nerve arises, running thence to one of the centers of the nervous system.

Observe this structure through your microscope, then carefully cut entirely around the ear drum with fine-pointed scissors and lift it off with needles. The auditory pit may now be seen and some of the details made out.

In the case of the katydid or other long-horned grasshopper, the ear is very differently situated, being on the first pair of legs. Strange place indeed, when considered from our egotistical human notion that the head is the only fit and proper location for ears! But then why not? Each foreleg has a pair of ear drums near the upper end of the tibia, the second of the two longest leg sections. The praying mantis and crickets have similar hearing apparatus.

Beneath the tympanic membrane of one of these leg ears is a structure somewhat resembling a piano keyboard called the chordotonal organ. When a thin section is prepared and examined under very high power, a row of sense cells is noted, each more or less rectangular and suggesting the white keys of a piano, while their nuclei, colored more darkly, suggest the black keys. A separate nerve fiber may be seen to rise from the inner ends of each of these cells and to lead inward, uniting in the main auditory nerve. It is presumed that each sense cell is adapted to receive sound vibrations of a certain pitch only, and that this form of ear is hence like a "receiving piano". Dissect the tympanum and inspect the inner cavity, even though the above fine details cannot be made out by ordinary methods.

An interesting point about hearing in insects is the strong possibility that certain species may emit and receive sounds of so high a pitch that they are inaudible to human ears. Did you ever listen to a cicada or other creature which begins slowly and at low pitch, the sound then rising higher and higher, like a fire siren? The noise seems to cease at an exceedingly high tone and for a few moments all is quiet. Then the singer resumes at the high point and gradually descends the scale, stopping suddenly at the low note with which it began. It is at least reasonable to assume that the curve is actually complete and that the apparent gap at the top is not such in fact, only that human ears cannot follow to such heights. Doubtless the ears of these insects and of their mates are finer instruments than ours and are attuned to receive wave lengths not tunable by the hearing organ of man.

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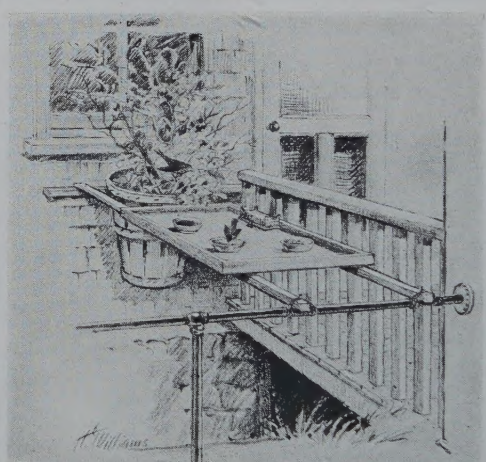
A New Deal for the Birds

By HELEN P. WILLIAMS

A TINY bird sanctuary, such as the one we have built alongside our porch, has brought countless hours of delight both to ourselves and to our feathered friends. We have a deep areaway alongside our kitchen window at the end of the porch. A rail protects this and from that rail to the window sill we placed two flat wooden sticks, two inches wide by one inch thick, about sixteen inches apart. Across these we screwed a board twenty-one by twenty-eight inches with a molding round the edge on top; leaving an open space between this table and the window sill just large enough to allow a peach basket to be pushed down so its upper edge holds against the table and sill.



In this basket we placed a bouquet of dried pussy-willows, black alder and branches with leaves still on them. This forms a partial screen and adds greatly to the confidence of our visitors. Small shallow dishes are filled with tidbits from our table and you have no idea until you try it how the birds love them. They are ravenous about cream cheese and love to sip sour milk.

It was always a problem to keep the squirrels from making away with the suet, but one day the kitchen soap dish caught my eye and the problem was solved. This soap dish was made of heavy open wire mesh. We turned it upside down screwing it to the table top by the wire loops. A right angle hook screwed in the table can be turned over the wire edge making it possible to open and close and place fresh suet under the wire cage. So far this has conquered Mr. Squirrel!

When winter storms begin we place on the table near the bouquet a narrow wooden box on its side, the top extended with an extra board held up by two little posts like a porch. One very snowy winter this retreat with its food beguiled a solitary hermit thrush into staying with us from December to April and he gave us two days of his wonderful song before going on his way.

This is our winter feeding station. One spring, larger birds were attracted when we neglected to remove the suet that was melting in the hot sun, so we made it a point to keep our table as neat as the finest hostelry, stocked with choice morsels to attract the first spring visitors. Now we enjoy the sight and sound of brown thrasher, catbird, oriole, scarlet tanager—male, female and young as they partake of the table d'hôte at our kitchen window. We wonder if they will miss their doles when one day they find the house empty and the table bare!

"Texas Rangers"

As they were millions of years ago

NATURE MAGAZINE'S staff artists, R. Bruce Horsfall and Garnet W. Jex, are shown in the accompanying photographs putting the finishing touches on two oil paintings that will be part of the Smithsonian Institution's exhibition at the Texas Centennial at Dallas.

In the top picture, brush in hand, Mr. Horsfall is discussing the *Camarasaurus* with C. W. Gilmore, curator of vertebrate paleontology, United States National Museum. Despite his thirty-foot length, *Camarasaurus,* who lived in the Jurassic period, was not as bad as he looked. He was a strict vegetarian and his diet consisted of the tender ferns and tree leaves shown growing in the background. This creature lived in the age when the first conifers began to appear. Behind the *Camarasaurus* can be seen this first ancestor of the cone-bearing trees. A bit to the right, pictured as a long spike that disappears off the top edge of the canvas, is the first ginkgo tree, once widespread over the northern hemisphere, but now unknown in the wild state outside of eastern Asia, although it has been introduced in many other countries.

In the left background similar animals can be seen wading in the prehistoric swamp, while at the extreme left a *Camarasaurus* is being attacked by an *Allosaurus.*

In the lower photograph Carl W. Mitman, contact officer of the Smithsonian Institution, is discussing with Mr. Jex the intricacies of the curious backbone appendages of the *Dimetrodon,* which has just come charging out of the woods and has frightened his numerous playmates. This beast, a carnivore, lived in the Permian period, a few million years before *Camarasaurus. Dimetrodon* was the first true land reptile, one branch above the amphibians on the tree of life. The similar creature on the opposite shore of the stream is an *Edaphosaurus,* a later development of, but not an improvement on the *Dimetrodon.* His head has shrunk to dog-like proportions and he has lost his flesh-tearing teeth. His spines, also, have grown ornamental spikes that are of no use to him in his battle for existence. Consequently, he soon disappeared. In the water near *Edaphosaurus* float *Eryops* and *Varanops,* both amphibians of the period. Resting against the stump in the foreground is *Diplocaulus,* a peculiar arrow-headed insectivorous amphibian that apparently had no legs.

The vegetation of this period grew in or near water, and resembled huge ferns more than trees as we know them today. To carry out this motif, note how Mr. Jex has left the mountains in the background bare of foliage. Nature, the great experimenter, was not satisfied with this representation of life, however. These animals of great strength gave way to smaller creatures with more thinking ability. Today, the story of these giant reptiles is found in fossilized remains.

HORSE TAILS

By PAUL GRISWOLD HOWES

KNOWN also as the scouring rushes, these odd plants are often overlooked. In the month of April, they send up their curious, spore-bearing shoots from creeping rhizomes that grow below the ground. Like the ferns they are true spore-bearers, and, therefore, classed as Pteridophytes.

The plants prefer sandy soil, and dense masses of them grow all along the railroad embankments of the New Haven Railroad, where they appear to thrive particularly well.

The spring shoots bear cones of fertile sporangia as shown in the larger photograph. These sporangia contain minute round spores to which are attached four long filaments with slightly bulbous tips. These are called elaters, and they are highly sensitive to moisture, the absorption of which aids in the dispersal of the spores that later germinate into new plants.

The fertile stems of the plants are later followed by quite different sterile stems in the summer. These bear whorls of coarse branches with tough, scale-like leaves. In the fertile stems, the leaves are represented by scale-like whorls, one of which is shown just below the cone in the center of the larger photograph.

When these plants are cut open, the stems are found to be hollow and jointed and made up of tubular cells called vascular bundles. These bundles strengthen the plant and carry moisture from place to place as it is required.

The most interesting thing about *Equisetum,* to which genus all the existing species are referred, is that its members are the atrophied, or degenerate descendants of a great group of huge horse tails of a by-gone age.

Millions of years ago, in the middle of the Mesozoic Era, giant horse tails called Neocalamites were common, growing in masses from water and swamps. They were one of the characteristic plants of the time, contemporaries of cycads and tree ferns and other odd-looking plants.

SPRING SHOOTS OF THE HORSE TAIL, MUCH ENLARGED
These are the descendants of a giant family that flourished during a by-gone age

Doubtless giant reptiles walked or swam among them and these horse tails of another day may have seen the great dinosaurs battling for supremacy along the shores.

The little horse tails existing today are therefore of ancient lineage. They are primitives, and though small and inconspicuous, they have survived the ages.

It is this suggestion of the primitive past that makes *Equisetum* of lasting interest and worth hunting out. Looked at closely from their own level, if the observer consciously eliminates the rest of his surroundings by simply forgetting them altogether, it is easy to visualize a great horse tail forest of the Mesozoic period. If this is not sufficiently interesting in itself, one might go a step farther and imagine the great reptile life this forest might contain.

Watch for *Equisetum* in April. In Connecticut the fertile cone-bearing stems appear from the first to the fifteenth of the month. If you live near a sandy railroad embankment within their range, you will almost certainly have no trouble in finding them. They also grow along roads, in abandoned fields, and in fact wherever it is dry and sandy. Farther north they line the shores of innumerable rivers and lakes, showing a decided preference for moist and even wet environments.

QUITE DIFFERENT ARE THE SUMMER STEMS
The sterile summer shoots bear whorls of coarse branches with tough, scale-like leaves

Living Matter In the Air

By CHARLES FITZHUGH TALMAN

AFTER A COLLECTING TRIP ALOFT

Collections of living matter at heights up to 14,000 feet were made by Fred C. Meier (left), student of upper-air flora and fauna, with Navy pilot Lt. A. P. Storrs at the controls of the plane

THE aerial ocean that envelops the earth does not equal the liquid ocean in the variety of its fauna and flora or in the abundance of life it contains. Nevertheless, the amount of living and organic matter in the atmosphere is enormous. One of the interesting recent revelations of science is that various forms of such matter, long known to be prevalent near the earth's surface, also exist many miles over our heads. This is true not only of microscopic organisms, but also of insects and other organic objects big enough to be visible to the naked eye.

Many years ago Louis Pasteur, the father of bacteriology, studied the minute living contents of the air up to a height of a few thousand feet with the aid of samples taken on mountains, and he conceived the idea, though he never executed it, of making spore-hunting trips in a balloon. Nowadays it is a common practice to collect organisms from the upper air during flights of aircraft. The upper limit beyond which no organic matter of any kind is present has not yet been found, but will perhaps be revealed by ascents of "stratosphere" balloons, which now include in their equipment apparatus for sampling the air and its contents at all levels.

RAGWEED SHEDDING POLLEN

One plant has been known to shed eight billion pollen grains in a single morning

The presence of living matter at various heights in the atmosphere is of practical interest to mankind. Generally speaking, the higher an organism is found the greater the horizontal distance it is likely to travel before it is deposited on the earth. Insects, including many kinds that are serious pests, are found at such heights that they must be spread far and wide by the winds, but fortunately those that reach the greatest heights are likely to be frozen to death before they return to the ground. Microscopic spores and bacteria are carried to much higher levels and survive the still lower temperatures to which they are thus exposed.

Numerous flights of aeroplanes carrying traps for collecting insects have been made in recent years under the direction of the United States Bureau of Entomology. In Louisiana these collections showed that a column of air one mile square extending from 50 feet to 14,000 feet above the ground contains on an average for all seasons about 25,000,000 insects, the range being from 12,000,000 in January to 36,000,000 in May. Though

the insect population is naturally densest at the lower levels, insects are very numerous as far up as flights have been made.

The insects, like other kinds of living matter found at high levels, are swept aloft by air currents, the lifting power of which is often great enough to carry up much heavier objects, including soaring birds and motorless aeroplanes. Thus it happens that among the insects collected thousands of feet above the earth are many that have no powers of flight.

Even the air of the polar regions is well supplied with organic matter, mostly transported from other parts of the world. When Col. and Mrs. Lindbergh made their historic flight over the Arctic in the summer of 1933 they collected the microscopic material floating in the air all along their route. The material was caught on glass slides, coated with a sticky substance and placed in a protecting case, devised by Lindbergh himself, known as the "sky hook." This was so arranged that the slides were kept sterile until the time of exposure, then exposed for about an hour, and afterward closed and tightly sealed. The collections were all sent to Washington, where they were examined under the microscope by Fred C. Meier, of the Department of Agriculture. Even over the icy wastes of Greenland numerous pollen grains, spores and various kinds of vegetable débris were collected, and some of the spores showed evidence of having been alive when deposited on the plates.

The mould that appears on bread and other foods whenever they are exposed for a time to a damp atmosphere is one of several evidences of the fact that spores of fungi are always present in the air, ready to germinate when they fall on a suitable substance. Fungi of all kinds produce spores in inconceivable numbers. Dr. Albert F. Blakeslee, of the Carnegie Institution, recently made a microscopic examination of a giant puffball, a member of the fungus family. A single specimen a foot long, ten inches wide and nine inches high was found to contain something like six trillion spores. If the spores of this one plant were spread evenly over the surface of the United States, there would be one spore to every fifteen square feet.

THE "SKY HOOK"

A variety of organic matter frequently prevalent in the atmosphere that has lately received much attention is this country is pollen, particularly that of ragweed, which is responsible for more than 90 per cent of all cases of hay fever in the eastern United States.

With the aid of weather observers in the United States, Canada and Mexico, Mr. O. C. Durham, of the Abbott Laboratories at North Chicago, has been making annual counts of the ragweed pollen grains in the air day by day in numerous localities, and he has published statistics and charts of great interest to hay-fever sufferers, showing the relative prevalence of this irritating pollen in different regions. The counts are made under a microscope from vaseline-coated slides, which the observers expose daily during the season of ragweed pollination—the late summer and early autumn—and send to Mr. Durham for examination. During the season of 1933 it is estimated that the total amount of ragweed pollen deposited in the United States was not less than 275,000 tons.

Pollen of plants other than ragweed also at times pervades the air in vast quantities. Pines and some of the other conifers are among the most prolific pollen producers. The air in the vicinity of a pine forest is sometimes filled with visible clouds of this substance which, rising from the trees, have been mistaken for the smoke of a forest fire. Formerly, it spread terror among the ignorant, who imagined it to be brimstone.

In the summer of 1930 a nighthawk was found helpless on the roof of a residence in Washington, D. C. The bird was taken to the Washington Zoo where he was turned over to Guy L. Eadie, one of the most experienced men on the institution's staff. Although these birds feed entirely upon living insects, Mr. Eadie found that a diet of chopped egg and beef was a good substitute when varied occasionally by a roach. The bird, *Chordeiles minor*, pictured above, is the only one of its kind in captivity so far as is known, and the Washington Zoo is the only zoo that has succeeded in keeping a specimen alive for more than a few days. This one has been thriving for six years.

"Sergeant Finnegan," a Sea-Lion

By THURLOW WEED

CAPTAIN GRAY discovered the mouth of the Columbia River in 1792. In February, 1936, another intrepid explorer saw the same rushing stream. He headed up the river.

On the morning of February 13, an idler on one of Portland's docks looking out over the flood-choked Willamette, a tributary of the mighty Columbia, saw an object moving rapidly against the current. An old salt, shading his eyes with a hand, said: "That's a sea-lion. They hardly ever go up a river farther than tidewater. This one's come nearly a hundred miles."

The next evening, a commercial fisherman near Oregon City felt his houseboat rock. He peered out the river-front window; saw what appeared to be a legendary sea serpent or river dragon. It was crawling upon his float. The fisherman let out a yell and ran for his gun. Three blasts roared out. The bulky shape disappeared in the churning water.

At Oregon City there is a large falls harnessed to run paper mills. The strange marine visitor was found at the foot of this natural barricade the next morning. Crowds gathered to watch the sea-lion coast on the top of the murky water, gaze curiously at his audience, and then slip noiselessly from sight. Soon he would reappear with a fish in his cavernous mouth.

The next day, the river visitor was made an honorary member of the State Police. "As long as none of the taxpayer's money is used to pay the animal's salary," declared the Superintendent of the State Police, "I think it would be fitting to take the sea-lion into our law enforcing body. One good sea-lion can work more havoc with the nets of salmon poachers than a dozen of my men, so I am going to christen him Sergeant Finnegan, and detail him to patrol the river. Any report he may make will be strictly confidential".

The newly-appointed officer patrolled his beat regularly for several days. But, on the twenty-first, "Sergeant Finnegan" discovered the 200-foot fishladder at the side of the falls. Like the good explorer he was, he started to climb in order to find what the upper river was like. It took him a half hour to surmount the watery cataract.

Reaching the upper river, the sea-lion headed upstream toward the state capital. It was suggested at the time that he was planning to visit the Police Superintendent in regard to a higher rating than that of mere sergeant.

The animal was not seen on the twenty-second or twenty-third, but on the morning of the twenty-fourth, a farmer heard a grunting noise in his rain-soaked grain field. An investigation disclosed "Sergeant Finnegan", A. W. O. L. from his post of duty.

The animal evidently had swum up the Pudding River, a small tributary of the Willamette, but, becoming tired of the all-water route, he had decided to see more of the scenic Oregon countryside. When found, the sea-lion had progressed nearly two miles. In the course of his wanderings he had flattened three hog-tight fences with his 1200-

pound bulk. Like most policemen, "Sergeant Finnegan" had big feet, and he was flipper-sore after the long journey.

Summoning aid, the farmer and his assistants teased the short-tempered mammal into a series of charges that brought it to a fence beside the highway. Here the sea-lion lifted his flipper in the well-known sign of the hitch-hiker.

Meanwhile, word of the unusual spectacle had spread through the surrounding neighborhood. No celebrity ever was given such a welcome in the valley of the Willamette. Schools were dismissed and school-buses used to transport the pupils to the pasture. Eight policemen were detailed to handle the crowd and protect the animal.

The sea-lion appeared weary and hungry, as well as peevish. It would leap a distance of six feet at those who got too close; left alone it did not attempt to attack. Its body, due to the unaccustomed exertion, gave off perceptible clouds of steam—like a freshly-opened baked potato.

Finally a Fish and Game Commission truck arrived from the capital. A block and tackle was rigged and the animal lassoed. It took forty-five minutes to get the sea-lion in the truck and the gate closed firmly behind it. "Sergeant Finnegan" made no audible protest other than an occasional grunt.

Driving the hundred miles to the Pacific took all afternoon, the truck stopping in all sizeable towns for the residents to see the widely-publicized animal. When the truck gate was opened on the ocean beach, the sea-lion flopped the four feet to the ground, but refused to budge toward the ocean. After nearly two hours of rest, he flippered himself to the water line, gave three eager and powerful lunges, and disappeared in the green breakers.

Thus did a strange, wandering adventurer return to his ocean home.

Robert Duryea, Sculptor Extraordinary

By BURKE EDWARDS

A PENKNIFE, a block of wood and the leisure time that is the curse of all commuters have meant a new career for Robert F. Duryea of Palo Alto, Calif.

Mr. Duryea is a civil engineer. His work made it necessary that he commute daily between his home and San Francisco. The weary miles grew boresome. The invention of the game of bridge was a salvation to many commuters, but it didn't interest Duryea. So, to pass the time, he turned to whittling. Tiny animals took shape under his skillful handling of the blade.

"Animals always fascinated me," he admits, now that engineering has been discarded for this more interesting art. "Alligators and penguins and sea horses I found particularly amusing. And I wanted an excuse for carving them."

THE FABLE OF THE ROC CARVED IN WOOD

He found his "excuse." Today his works of art adorn the stately mansions of California's seacoast. Longhorn Texas steers serve as footscrapers and bronze seahorses gambol in fountains on the estates of the famous. Poodle dog automobile radiator caps were demanded by matrons who owned poodle dogs. From there it was just a short step to book-ends and faucet tops.

"Some creatures seem especially fitted by Nature to grace garden faucets," Mr. Duryea says. "Frogs and dragon flies are particularly adapted to gardens."

His hobby became a fad. Horses, dogs and cats, butterflies and trojan horses sprang from under his knife. For Mr. Duryea, a swordfish is a letter-opener. Kangaroos and pelicans are smoking stands.

We first learned about Mr. Duryea when he sent us the accompanying picture of a carving of a Roc.

"The sketch in the article about the Roc in the December issue of NATURE MAGAZINE brought to mind a composite photo I took a year or so ago of two of my carvings," he wrote. "My roc is of juniper driftwood found near our camp in the Sierras. Twisted by frost and wind, it suggested a roc to me and I worked it to its finished shape with a jack-knife while sitting around the campfire. The natural grain and weathered finish of the wood was left wherever possible. From feet to wing tips is about 24 inches. The rhino is a separate carving but was photographed as shown to bring out the roc idea."

The Nature Picture of the Month

One of Nature's greatest engineers, the yellow and black garden spider, has been actively at work in this setting of Queen Anne's lace. Placed where many small insects may be expected, the webs give promise of a well-stocked larder.

This attractive photograph, chosen for special award this month, is the work of W. S. Hinegardner of Niagara Falls, New York. The picture was taken near Amherst, Massachusetts, with a Glunz camera.

Selecting the "Nature Picture of the Month" has been no easy task since the Rotogravure Editor began making these awards. He has been confronted by an embarrassment of riches testifying to the outstanding skill of many whose hobby is hunting Nature with a camera. Many of the pictures chosen for publication, but not for special distinction, have been nearly as good as the featured photographs. It is felt that, in view of this, it would be fairer to all to consider photographs submitted to the Rotogravure Editor from the point of view of purchase rather than as entries in a contest.

Outstanding pictures will, therefore, be published as the "Nature Picture of the Month" in the July, August and September issues, and other good pictures will be purchased at the regular rate. Beginning with the October issue, however, we will publish pictures from Nature photographing amateurs, buying these currently as submitted. This will avoid delay in many cases.

Pictures submitted should be accompanied by fifty- to one-hundred-word captions naming the subject and place where the picture was taken, and including any other interesting or pertinent information. The Rotogravure Editor is particularly interested in groups of related pictures showing the life history of some Nature form, or otherwise telling an effective picture story.

BLUE GOOSE. For more than sixty years after this beautiful goose was well known and had been formally described, its nesting place was unknown. It was not until 1929 that J. D. Soper found its nest in Baffin Land. The nest here shown, however, is that of a captive bird that was induced to nest in one of Canada's Parks. Photographs courtesy of Canadian National Parks.

CANADA GOOSE. This is North America's most notable and wide-ranging goose. Formerly nesting in all of our northern States, as well as practically all over Canada and Alaska, the lessening flocks that each spring and fall thrill the dwellers of city and country alike now come mainly from northern Canada. This goose is covering her eggs with down before leaving.

Working with wind, water, frost and sun, Nature has fashioned many strange and beautiful things. Many of these are preserved for posterity within the borders of our National Parks. Here we see Bryce Point towering like a guardian angel over Nature's sculpturings in Bryce Canyon National Park in Southern Utah. Photograph courtesy of the Union Pacific Railroad.

Nature, here using wind and water as her tools, has carved from the ancient earth that vast void men now call Death Valley in southern California. These visitors are standing at Dante's View on the slopes of the Panamint Mountains. From here one looks down from a height of six thousand feet to the valley floor 260 feet below sea level, and across its mirage-distorted waste to the Funeral Mountains, fifteen miles away.

At the left is a beautiful Nature scene, in part the result of man's works. It is Boulder Lake, twenty-seven miles above Boulder Dam, where tremendous cliffs of lava rock now rise straight from the water's edge. The two photographs on this page by courtesy of the Union Pacific Railroad.

The Grand Canyon, age-old work of the Colorado River, has inspired many reactions from those who have come to view the majesty of this scene. One visitor, in the picture on the opposite page, is silently studying the glorious panorama from the vantage point at Desert View Point on the South Rim. In the other photographs we see groups of visitors to two more of our National Parks. One group is reliving the day of a past civilization as they view the ruins of Spruce Tree House in Mesa Verde National Park, Colorado. The other group is admiring the formations in Carlsbad Cavern in Carlsbad National Park, New Mexico. Photographs courtesy of the Santa Fe Railroad.

The Least Tern

A hundred years ago the least tern, the smallest species in America, occupied numerous breeding colonies along our seacoast from Maine to Texas, on sandy islands in the Mississippi Valley north to South Dakota, Nebraska and Kansas, and on the coast of Southern California. South of the United States it abounded locally on both coasts, as far as Argentina and Peru

Many circumstances have conspired to reduce the numbers of this beautiful bird. The first major catastrophe was the extensive slaughter of the old birds on their breeding colonies to supply the trade in plumage, chiefly to ornament women's hats. The greatest slaughter occurred between 1875 and 1900, when the birds were almost exterminated. On and near Cobbs Island, on the Virginia coast, a thousand were sometimes killed in a day; on one hunt, three men killed 2800 in three days, sending them packed in ice to New York City and receiving ten cents for each bird. At the same time a similar slaughter was going on at many other points along the coast

By the combined efforts of the National Association of Audubon Societies and the United States Bureau of Biological Survey, the killing of these and other American birds was finally outlawed, and a few refuges were set aside for beach-nesting birds. So pitifully reduced were the terns, however, that there was little noticeable recovery for some years. Many original nesting sites had been set-

tled and even the mere presence of summer visitors was detrimental. The natural hazards of high tides and severe storms also played havoc with the small surviving colonies. During late years, however, some of the colonies have increased somewhat, and it is now felt that the species has been saved from the extermination that threatened it on our coasts.

The accompanying pictures show several phases in the life of the least tern. First the graceful pose as the bird flies overhead when its nest is approached. Then a bird anxiously covering its eggs under the eye of the camera, and a single egg on the shingle. The last three pictures show how perfectly the young merge into their surroundings when they suspect danger. These pictures are selected from a series taken by Ivan R. Tomkins on the coast of Georgia not far from Savannah.

The American Bison is the famous bovine that formerly occurred in millions on the great plains of the United States and Canada and now survives to the number of a few thousands. Most of these live in fenced enclosures. One of the largest of these herds is in Buffalo National Park, Wainwright, Alberta, where the picture of the old bull here shown was taken. Here his ancestors ranged wild.

Besides the herds that are under fence, there are at least two that roam unconfined. A small number in Yellowstone Park are descended from the original stock of that once remote wilderness. There are also several hundred "wood bison" in the plains and forest country south of Great Slave Lake in Central Canada.

Many years ago it was found that the wild bison and domestic cattle would interbreed and produce fertile offspring; this was called the cattalo. The cross, however, proved to be an economic failure. The white face of this bull cattalo bespeaks Hereford ancestry. Photographs courtesy Canadian National Parks.

Spring Flowers of Alaska

Photographs by Maxine Williams

Tourists who are fortunate enough to be in Alaska when the cotton grass is in bloom are treated to a lovely sight. This field of brown cotton, ***Eriophorum chamissonianum,*** grows near Juneau, with scenic Mendenhall Glacier as a background. Other forms of ***Eriophorum,*** mainly white, are found in marshy places all over Alaska. If picked at the right time and dried, the flowers make lovely bouquets.

The exquisite shade of blue exhibited by this wild geranium, ***Geranium erianthum,*** was not appreciated until the sun was seen shining through the petals. The feeling of looking into and through such a color was for a moment so breath-taking that the picture was almost forgotten. A companion of the mountain anemone, the wild geranium also comes down to mingle with lowland dwellers.

Clouding roadside fields of mountain meadows, or growing alone on the bank of a swift glacial stream, as did the one here pictured, the star flower, *Trientalis arctica*, is a gay little blossom that nods with every passing breeze. The flower is pure white, topping a plant less than six inches high. This species is found mainly in the coast region from sea level to mountain meadows above timberline, from the State of Oregon to Alaska.

Grass of Parnassus, *Parnassia fimbriata*, commonly grows on the banks of streams and ponds, ranging in the mountains from southeastern Alaska south to Oregon and Colorado. The flower is a lovely pure white, with fringed petals. Other members of the genus enliven watersides nearly all the way across northern North America.

Shooting star, or "bird bill", *Dodecatheon frigidum*, is a northern representative of this group of lovely plants, members of the Primrose family, that boasts one or more species in most localities in temperate North America. Whether in eastern woodlands, on the sage-brush plains of the West, or in the mountain meadow, this perky flower is always a welcome sight.

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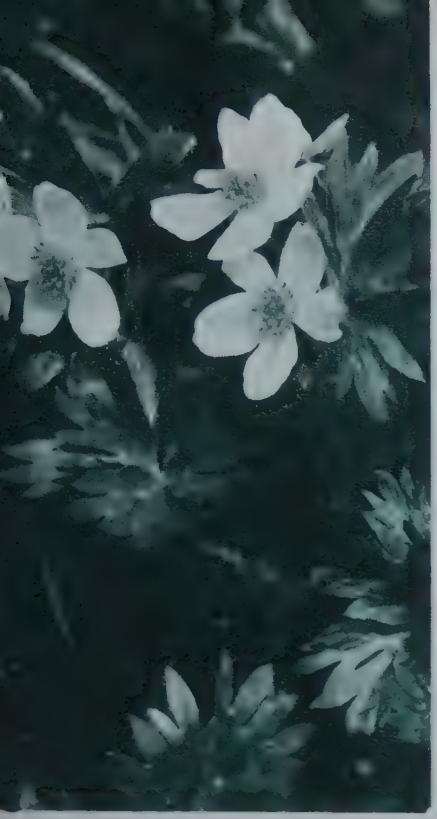


This anemone, *Anemone narcissiflora,* is a lovely flower whose sepals show the delicate waxy sheen of a narcissus petal. It has an extensive altitudinal range on our western coast. The picture was taken in a mountain meadow near Juneau.

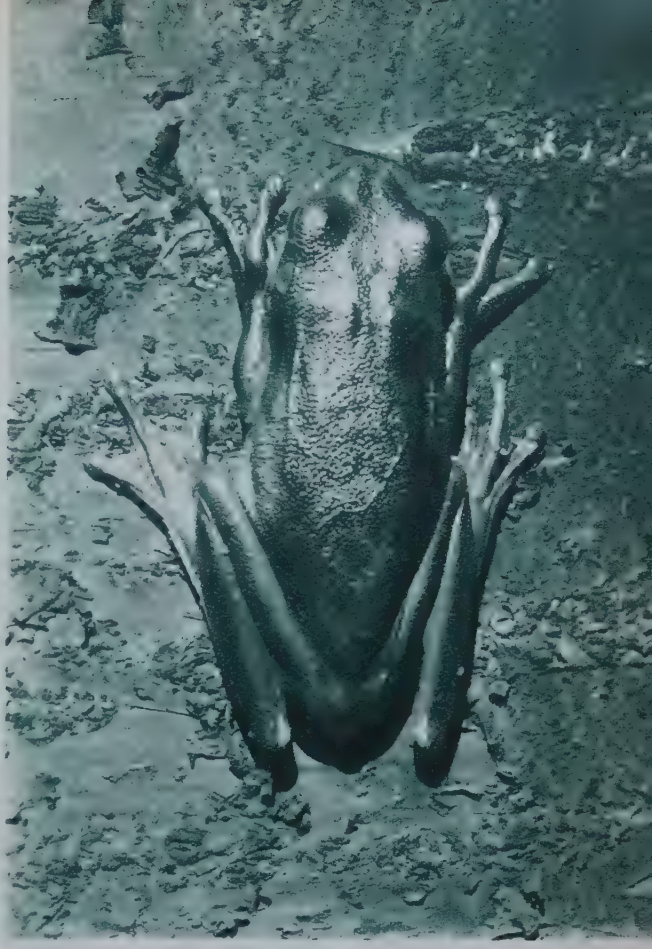
The western skunk cabbage, *Lysichiton americanum*, like its eastern relative is one of the earliest spring flowers. Bears, just out of hibernation, eat its fleshy rootstock

At the right above is an orchid known as *Limnorchis leucostachys* and, locally, as "wild hyacinth". It is the most showy of the several western species of the genus, and grows in boggy meadows from Oregon to Alaska

Of all the treasures the alpine flora has to offer, many would name as first choice the gay audacious alpine bluebell, *Campanula lasiocarpa*. It flaunts its huge bell on a short stem and dares the sudden gusts of wind to uproot it. It clings to rocky cliffs and bare knolls and seems to be ringing its bell to attract the notice of the weary mountaineer. Seeing these lovely blossoms braving the frosty heights, one understands the enthusiasm of the Scot for his bonny bluebells

The marsh marigold is a splash of brilliant yellow and gold floating on the ruffled surface of some rain-splashed pool, enlivening even the dreariest of dreary spring days. It is known as *Caltha palustris* and, also, as the cowslip. It grows on the edges of ponds over much of southern Alaska, and is especially welcome to those from the east, who, whether from eastern Canada, or from anywhere between New England and the Lake States, probably have gathered its blooms for bouquets and its leaves from spring greens.

Demurely sitting by a waterfall or gurgling stream is the maid of the mist, *Romanzoffia sitchensis*. It seems to stretch its eager white face to catch the floating mist. This little group was within a foot of a small creek that hurried down the mountain side. A creamy-colored center breaks the otherwise solid white of these dainty blossoms.



The lovely grass-green marsh frog of our east-coast swamps, *Hyla cinerea,* is here shown about twice natural size. This species delays its breeding, and therefore its singing, until really hot weather. Then its "tinny" call may be heard in the cattails in the tidewater marshes that constitute its home. By a careful approach one may detect and seize the agile songster before it jumps beyond reach into the tangle of reeds. Photograph by L. W. Brownell.

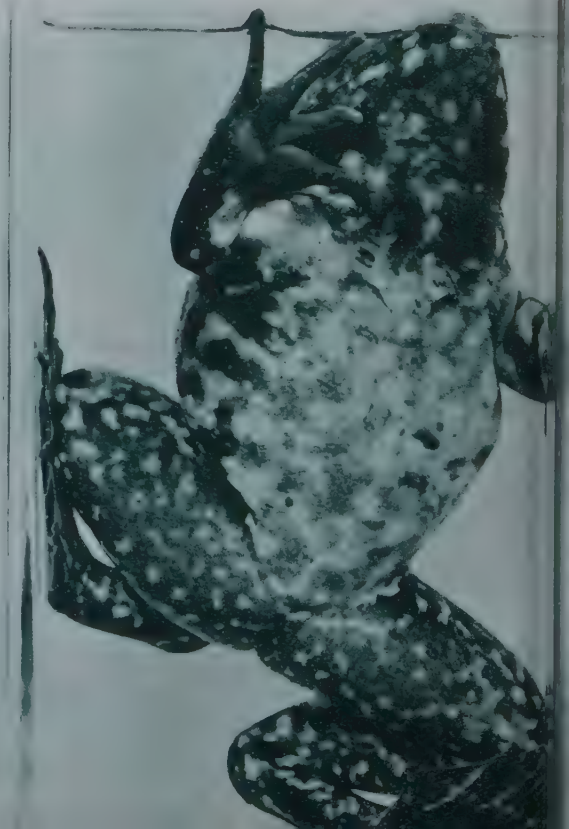
At the left, beginning at the top, are shown three other notable species of *Hyla.* First, the spring peeper, *Hyla crucifer.* This little announcer of spring was photographed in the New York region. The picture, which is nearly twice natural size, shows especially well the pattern that suggested its name, "the cross bearer". Courtesy American Museum of Natural History.

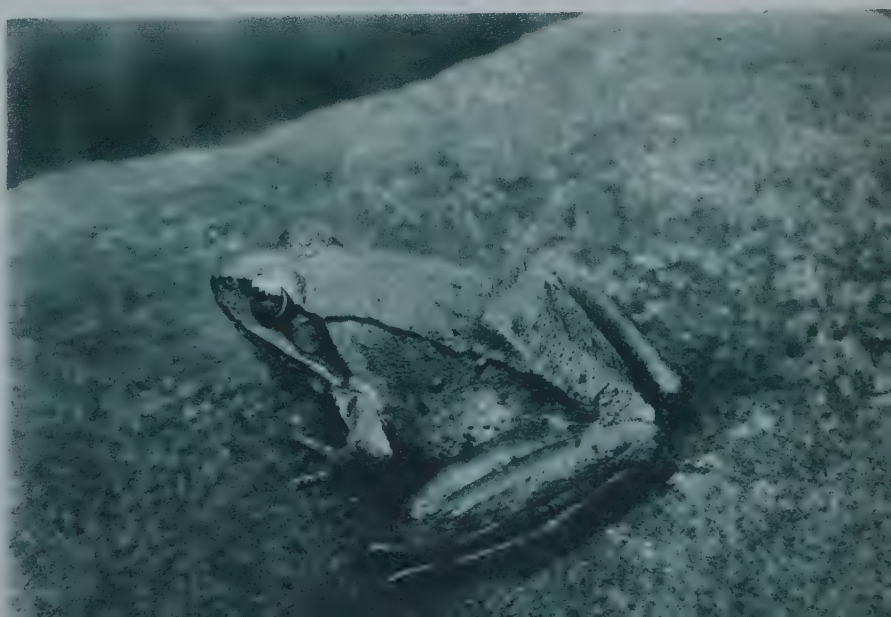
Next the western tree frog, *Hyla regilla,* caught in the act of amplifying his spring song by means of his expansible bellows. About twice natural size. Photographed near San Jose, Cal., by Gayle Pickwell.

Hyla andersonii, colorful relative of our common spring peeper, is here shown about three times natural size in its New Jersey home. Photograph by L. W. Brownell.

Anderson's tree-frog, *Hyla andersonii,* is here shown at home in a New Jersey swamp. This photograph shows how difficult it may be to perceive the tiny musician even after one has located his general position by hearing. Unless much alarmed the little piper remains perfectly still amongst the opening foliage, and only the trained eye can detect him. This species is known only from a rather narrow strip of coastal swamps from Georgia to New Jersey. Photograph courtesy of the American Museum of Natural History

Below are well shown the dorsal and ventral patterns of the alligator frog, *Rana heckscheri,* a species long confused with the bull frog and nearly as large as ordinary examples of that species. Its popular name refers to its voice, which resembles that of the alligator. It inhabits a rather limited area in southern Georgia and northern Florida. These photographs, which show the creature at about natural size, were taken by Francis Harper near Okefinokee Swamp in southern Georgia





Fowler's toad, *Bufo fowleri,* is common over most of our eastern states. It is easiest to distinguish from the common toad, *Bufo americanus,* often found in the same places, by its voice. Its call is less prolonged and more harsh than that of the common toad, and is commonly heard later. When the clear, prolonged trilling of the common toad has been heard for two or three weeks in the marshes, the less pleasing squall of Fowler's toad comes to the ear. Fowler's toad is the first of the three pictures on this page.

There is no essential difference in the breeding habits of the two species and the young are indistinguishable. So great is the individual variation in color and size of the two species, that individuals are often difficult to identify. Fowler's toad is usually the smaller. The two here shown are about maximum size for the two species.

The wood frog, *Rana sylvatica,* is one of the earliest of our eastern species to appear. Digging out from its winter retreat below the frost line in the leafy woods, it seeks the earliest of the open waters, even should only one side be ice-free. Then its queer crackling notes greet us. After the duties of breeding are over, the adults take to the woods where they soon discard their dark green coat for one of yellowish brown, to match the dry leaves and pine needles of the woods-carpeting. Photographs by L. W. Brownell.

and well northward into Canada. The one at the left represents about the maximum size of the species. Photograph by L. W. Brownell.

The bull frog, *Rana catesbeiana,* is everywhere becoming rare because of its close pursuit for food. Frogs' legs still appear on many menu cards, and frog farming has not yet achieved economic importance sufficient to relieve inroads into the wild supply of bull frogs. This frog ranges over most of the eastern half of United States. Its commercial value has resulted in its introduction into parts of California, where it has now become established as an adopted dweller of that State. The photograph here reproduced is of a good-sized bull frog of proportions sought by those who gather them for their legs. The photograph was taken in the East by L. W. Brownell.

The leopard frog, *Rana pipiens,* is one of our species most commonly seen because of its habit of frequenting moist grassy fields in the summer. It winters at the bottom of springs and other waters that do not freeze. Like all our frogs it breeds in streams and pools. It ranges widely between the Atlantic and the Rockies,

★ Conservation ★

A section of Nature Magazine devoted each month to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

ARTHUR NEWTON PACK, *Editor*

WATERFOWL DECLINE ★★★

The history of American waterfowl has been one of almost uninterrupted decline ever since the country in general has been inhabited by white men. Destruction of breeding grounds by drainage no doubt has been an important factor adverse to the wild fowl, and it is an irrevocable one. Our efforts in creating refuges, while laudable, are far too puny to have any notable effect on wild fowl numbers. The loss of breeding grounds on the whole is irretrievable, and so far as we can judge, the former wild fowl nurseries of the northern Great Plains Region will never be restored to anything like their former productivity. The waterfowl have seriously decreased in the experience of every generation of our people, so that there is not one now existing where there were formerly a thousand, and they are regionally subject also to special catastrophes as drought and disease that in some years almost nullify reproductive effort.

Not only has the natural production of wild fowl been most drastically reduced, but the number of hunters has vastly increased. All wild fowl resorts are now accessible to hunters and the birds are safe nowhere except on inadequate refuges and by virtue of the protection of closed seasons, and other restrictive measures.

Under these circumstances, vastly reduced reproduction of wild fowl and greatly increased kill by hunters, there can be only one result, namely, steady progress toward extermination, and that is exactly what is happening to our waterfowl at the present time. Sportsmen, at least all of those to whom the word can properly be applied, certainly will want to do all in their power to prevent the impending debacle of our waterfowl. To permit, worse to cause, the extermination of any of them is a crime against Nature, and a thing civilized man should never allow to occur.

To sum up: It is certain we cannot go on killing more and more ducks every year when fewer and fewer are being produced. If we are to deserve the name conservationists, we will take effective steps to preserve our wild fowl now and forever, and that too without grumbling. Insistence on continuance of shooting privileges when the very existence of some of the species is at stake is neither good sportsmanship, good citizenship, nor good sense. The wild fowl can be shortsightedly exploited into oblivion, but determined insistence by real sportsmen and conservationists on application of infallibly dependable protective measures will prevent the threatened extermination of Ross's goose, of the redhead, the ruddy duck, the gadwall, the bufflehead, and other beautiful waterfowl —a preventable tragedy, failure to avert which would be utterly disgraceful to civilization.

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HUNTING AND EXTINCTION ★★★

A recent Science News Letter informs us that the rare mountain zebra is near extinction. "Only fifty or sixty of South Africa's rarest animal, the mountain zebra, are left alive, and no funds are available for the further protection of the two small herds, Dr. E. L. Gill, director of the Cape Town Natural History Museum, has announced. A strict law for the protection of this animal was passed some time ago, but has never been really enforced, so that hunters have done their worst. There were 2,000 animals a few years ago, only fifty or sixty now, and this small fragment is apparently doomed."

South Africa's experiences with the deadly effects of hunting are not confined to this deplorable instance but involve most of the wealth of antelope and other big game that once abounded there. That experience is parallel with our own in that hunting long has been, and continues to be, a serious threat to all animals utilized as game.

In South Africa legal protection is not saving the mountain zebra and in the United States the protective influence of law never keeps pace with the necessities of wildlife. We have had game laws since colonial times but game populations, nevertheless, have steadily declined. The process has aptly been termed one of legalized extermination and as a pressing modern instance its effects have yearly become increasingly apparent on our waterfowl. While a few widely distributed and adaptable

species remain fairly common, several of the more local and specialized forms are already reduced to a dangerous extent. Due to inability of hunters to identify the birds before they have shot them, attempts to protect the threatened species while permitting shooting of the more common kinds result in the rare being killed along with the others. It is quite apparent that by this process some species can be exterminated while others continue to exist in rather large numbers.

Seeing fair concentrations of any wild ducks makes ill-informed hunters skeptical about dangers inherent in the situation and creates opposition to further restrictions on shooting privileges. As is the case in South Africa, hunters want to keep on shooting even if the very existence of certain kinds of game is threatened.

Usually they ask "how are you going to enforce additional restrictive measures?" and point out that warden forces are inadequate. This is as much as to say "we will not respect protective regulations except under compulsion." There cannot be a warden for every hunter and unless hunters voluntarily abide by protective laws and regulations, game species, the perpetuation of which should be their highest interest, cannot be saved.

No law is literally enforced by sheer pressure upon every actual or potential infractor. In fact laws have their greatest strength in the support of public opinion. The section of the public most benefited by game protective laws, namely, the hunters, should be the most devoted upholders of those laws. They should be the last to ask "how can they be enforced?" Rather they should firmly declare, "We will obey them."

A greater public far outnumbering the hunters is interested in assuring that no useful and beautiful forms of wildlife are excessively persecuted and threatened with extinction. They will join hands with the sportsman at any time in securing legislation that will effectively protect threatened species. Will the sportsmen cooperate to save the things in which they are most interested? They call their organizations conservation societies, but the necessity of proving their right to the term was never more apparent than now. Are we going to have real conservation or only lip service to the idea? It is up to the sportsmen more than any other group to take action that will leave no doubt that our game fauna is to be safeguarded—saved from the fate that seems everywhere to threaten hunted species.

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SPENDING FOR CONSERVATION

According to the official federal estimates for 1936, no less than six hundred seventy million dollars are to be spent within the fiscal year by and through federal bureaus, solely for the conservation of renewable natural resources—land, trees, and wildlife. (This huge sum does not include any part of the cost of the great T.V.A., or the so-called conservation features of the late A.A.A.) Back in 1930 forty-three million dollars per year was deemed adequate to cover the same purposes. The increase of annual expenditure in six years shows an amazing figure of 1500 percent.

It is all very well to point with pride to this vast expenditure as evidence of constructive federal interest in conservation, but a conservationist is also a taxpayer and, as such, will want to know how much of this money has produced really tangible and effective results, and how much of it has been absorbed by the duplications and red tape of bureaucracy.

There are some strange anomalies in such expenditures. We have three different bureaus in two separate government departments, each with machinery to administer livestock grazing on federal lands. Entirely aside from the resulting confusion, is it not clear that overhead expenses are duplicated? We have a Biological Survey and a Forest Service, each charged with responsibilities as to wildlife, but neither able to control winter range for big-game animals in the West, because that winter range is in the jurisdiction of still a third bureau in another department. All three bureaus spend money, but can accomplish little for wildlife, which, except as regards migratory species, has always been the property of the various individual states, anyhow. We have a new bureau, the Soil Conservation Service, which operates on both public and private lands with another separate set of offices and another overhead expenditure. The list of inter-bureau conflicts and duplications goes on interminably, and comes to public attention only when something utterly ridiculous happens, such as, for instance, when on a certain day last year one federal bureau stocked a lake in New Mexico with fish and, on the very day following, another federal bureau drained the lake and killed every finny inhabitant.

Is this conservation? It certainly is not conservation of the tax-payer's money, and, sooner or later, unless something is done, the tax-payer's objections will surely result in the cutting off of many worthwhile conservation projects simply because they are too expensive to maintain.

And yet the answer is not hard to find. The federal bureaus concerned with the conservation of renewable natural resources must be put together in a single department, divided and reorganized under a single head, so that this terrible waste of millions can be eliminated. Many bureau officials and citizen supporters of the separate bureaus that further certain pet projects of those citizens say it can not be done. If these "experienced persons" are right, then conservation is in for bad times. Congress will surely act sooner or later to trim the budget, and bureaucrats in and out of the bureaus will be left holding an empty sack.

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California Sugar Pines

Axe and saw soon to raze trees bordering Yosemite Park

By IRVING BRANT

Out on the border of Yosemite National Park one of the most atrocious crimes against conservation in American history is now being consummated. The Cary Inn-Tuolumne grove of sugar pines, covering 9600 acres, rated by John Muir as the most beautiful grove of trees in the world, is going down beneath the axe and saw and overhead cables of the lumberman. When the crime is completed, the northern approach to Yosemite Park, now a source of awe and inspiration to all who pass through it, will be a sickening shambles—a scene of desolation familiar to all who have witnessed the destructive ferocity of high-rigging lumbering, but here heightened by contrast with the matchless beauty of the forest as it stands today.

With the resumption of logging by the Yosemite Lumber Company this spring, a fourteen-year fight by conservationists to save the Carl Inn sugar pines approaches apparent failure. Time and again the grove has been saved by fortuitous events in the business world. The depression gave it a six-year respite from what seemed imminent doom in 1930. Now the end is at hand. One by one, with sickening rapidity, 500-year-old trees, ten feet in diameter and towering to the skies, are crashing to the ground to be dragged out on overhead cables, tearing out everything in their path and rending the earth like giant plowshares as they go.

These are the trees that moved John Muir to write in *Our National Parks:*

"Many of the pines are more than two hundred feet high, but they are not crowded together. The sunbeams streaming through their feathery arches brighten the ground and you walk beneath the vaulted ceiling in devout, subdued mood as if you were in a grand cathedral with mellow light sifting through colored windows while the flowery pillared aisles open enchanted vistas in every direction. . . .

"Perhaps the best general view of the pine forests of the park and one of the best in the Range is obtained from the top of the Tuolumne and Merced divide near Hazel Green. On the long, smooth, finely folded slopes of the main ridge at a height of five to six thousand feet above the sea they reach the most perfect development."

What does he mean by "the pine forests of the park"? Are these trees, now being lumbered, located within a National Park? No, but they were inside Yosemite Park when John Muir wrote—a fact which in itself would not have sufficed to save them, since they were privately-owned. They were set outside by an ill-advised Act of Congress in 1912, put through at a time when nobody realized that the great virgin forests of the Far West were doomed to disappear as surely as the grizzly bear, save as they were protected and preserved by action of state or nation. At that time nobody thought of the common sense plan of buying up private lands in the National Parks.

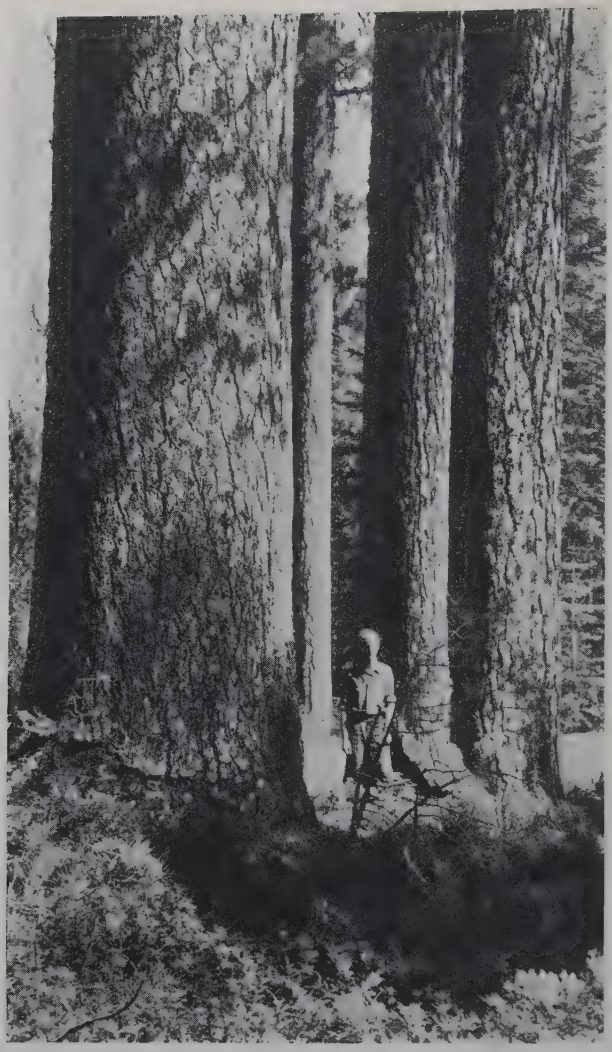
COURTESY EMERGENCY CONSERVATION COMMITTEE

THE SUN STREAMS IN AMONG THE TREES

Mixed forest dominated by the glorious sugar pines near Carl Inn. The man by the tree is six feet tall

Later, yet not too late had action been prompt and adequate, people began to understand that forests of giant trees which come to maturity in from 300 to 1000 years are as fit subjects of protection as the mountains and waterfalls themselves. This was first recognized in the guarding of the ancient sequoias, but these oldest and largest of living trees were few in number and closely concentrated. Even then, Muir and others labored for years to rally public opinion in their defense.

The sugar pines, hardly smaller than the sequoias and surpassing them in beauty, were so numerous thirty years



THE GREAT BULK OF A SUGAR PINE TRUNK
Rivalling the redwoods in size and height, the sugar pines are felt by many to surpass them in beauty

ago in California and Oregon that the thought of protecting them would have raised a laugh. But the unusual value of the wood, resembling eastern white pine, has subjected them to lumbering so intense and thorough that all mature trees are vanishing as did the white pine. As a widely scattered forest crop, lumbered before reaching maturity, sugar pines may last forever, but if the people of America are to know them as John Muir did, to sense their majesty and their beauty, it must be within the confines of national parks or other sanctuaries.

Realization of this fact led to a successful effort, late in the nineteen twenties, to stop the lumbering of sugar pines on privately-owned land that had remained in Yosemite Park after the trimming of the Park in 1912. A congressional appropriation of $1,600,000 to buy these lands, offered on condition that it be matched by private gifts, was met 100 per cent by John D. Rockefeller, Jr., in 1928, and the aggregate of $3,200,000 was put to invaluable use.

Unfortunately, the lumbering menace at that time was directed so heavily against private lands within the park boundaries that all efforts had to be concentrated to save the Park from ruin. The Carl Inn Grove, most beautiful of all, was doomed by its location. Lying just outside the Park, though naturally a part of it and formerly inside, it was not eligible to purchase under the Act of Congress and nothing could be spared for it from the Rockefeller fund because that would have cut down the federal grant. Had it still been in the Park it would have been one of the first tracts sought for preservation.

Following the Rockefeller purchase, a new effort was made to save the Carl Inn Grove. Senator Nye introduced a bill in 1932 authorizing the government to acquire these lands from their private owners and add them to the Park, giving in exchange a stand of timber of equal value from the national forests. This bill, unfortunately, was blocked by local hostility in California. Tuolumne County, struggling to keep up its schools and roads, fought to retain the few dollars in taxes that it received from this privately-owned forest (taxes which will be paid no more after the trees are cut, for the land is worthless). So Senator Nye's bill rested in a pigeonhole, while the depression years lulled conservationists and park officials into a false feeling that haste was not imperative. They awake today to a crisis so acute that the slow-moving processes of national legislation are useless. Of no avail today to ask for a trade of timber; the trees are falling.

Part of them can still be saved—for the finest of them and those most needed to preserve the beauty of the Park are farthest from the mill—but only by some sudden miracle of generosity among the people of America, rivalling the Rockefeller gift in size and sudden spontaneity.

The fate of the sugar pines rests now with those who know these trees and know of the crime being committed and who are in a position to save them. One man or woman, a dozen, a hundred, a thousand, may do all that can now be done, or may lessen the atrocity a little by saving the trees along the highways. There is but one way to save them, and that is with coin of the realm, for no sentimental appeal can be made to impersonal forces of finance that have ordained their destruction.

There is bitter irony, now, in the place these sugar pines hold in the minds of thousands of Americans. Traversed by three of the principal Yosemite Park highways, this grove has been almost universally looked upon as public property, a part of the Park itself, an unparalleled example of the foresight and wisdom with which the nation has acted to preserve its assets of irreplaceable beauty. The error was all the more inevitable because on two of these highways, running from the floor of Yosemite Valley to the Hetch Hetchy reservoir and to Tioga Pass, the motorist is in Yosemite Park both before and after he traverses the sugar pine grove. Naturally he assumes that he is still in the Park when he passes through the finest and most inspiring portion of his route. Little does he dream, when he looks up at the great, smooth-trunked pines towering 240 feet above him, their branches pendant with the weight of gigantic 18-inch cones, majestic beyond all human concepts of majesty, that this glory of the Yosemite region is doomed to ruthless obliteration by the saw and axe. (Continued on page 380)

WOMEN AND CONSERVATION

EVERY women's organization in the United States that is interested in wildlife conservation should become an integral part of the newly formed General Wildlife Federation. This is a great opportunity for the 14,000 member groups of the General Federation of Women's Clubs, as well as for the thousands of garden, civic and outdoor clubs that are scattered throughout every state, to take an active interest in this new conservation organization and for their work receive nationwide acclaim.

Reading from the preamble of the Wildlife Federation's constitution, we find that "the natural resources of this continent are economic, social, recreational and aesthetic assets which should be restored and perpetuated for our posterity, and realizing that this can be achieved only through an aroused and enlightened opinion among the people of this nation, we dedicate this federation to these ends." This avowed purpose of the Federation is indeed a noble one, and the part that the women of the nation can play in aiding the Federation to attain the ends to which it has dedicated itself is enormous, and entirely worthy.

A report from Michigan's department of conservation reveals an interesting angle to this problem. It says, in part, that where men "generally are inclined to view conservation from the standpoint of hunting and fishing and the maintenance of game and fish for that purpose, the women are thinking of ways and means of maintaining forests and wildlife for their aesthetic value and recreational enjoyment." In balancing these two interests Michigan believes that ultimately it will have a much broader and better balanced program of conservation. It is our hope that this "better balanced program" may be instituted throughout the 48 states through the American

TAME AS A KITTEN

Billy, a deer who came to the Ogemaw, Michigan, game refuge every evening to feed, became so tame that a bell was placed around his neck as a protection from hunters

women's affiliation with the Federation, and the injection of their influence in its conduct.

Michigan's women began their conservation work about two years ago, cooperating with the state conservation department. Literature has been distributed and programs given. A booklet, "Conservation Handbook for Women's Organizations," has been prepared, offering suggestions for conservation programs, practical projects that women might undertake, and miscellaneous conservation information. Within the last few years, various clubs at one time or another have appointed special conservation committees to carry on the work. Some groups have sponsored municipal forests; others have developed bird sanctuaries; and one Detroit organization inaugurated a wildlife and wild flower sanctuary, "Wild Woods Trail," which will be accessible to a great many people whose opportunities for nature study have been limited in the metropolis.

It would be well for other states to follow Michigan's example in seeking cooperation of women's organizations.

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A BOUQUET FROM THE BUTCHER BOYS

"THE outlook has been dark this year; but rays of sunshine are filtering through. 'Our migratory waterfowl are coming back' is the lead-off sentence in a bulletin recently received from the Bureau of Biological Survey. Six million dollars have been appropriated by Congress. Hundreds of thousands of acres of long-dry nesting areas are being reflooded. However, even with improved conditions next year, we will still have to battle the Audubon Societies, American Nature Association, the Hornadays and Edges, etc., who are untiringly at work to silence your guns.

"It is time to plant your seed ***** in fertile soil that will produce a 'crop' of action and influence necessary to cope with the groups mentioned above, who, incidentally secured over a million signatures this year to letters and petitions demanding a closed waterfowl season. Plant your seed NOW, in the shape of an affiliated club membership in our organization—it costs but $50.00 a year. Plant NOW to assure a 'crop' being harvested *in time* for the battles to come."

This statement is from an announcement dated November 12, 1935 from the Fish and Game Development Association of California, with offices in San Francisco and Los Angeles. It claims 40,000 members, belonging to seventy-nine hunting and fishing clubs. Its motto is: "More Fish and Game in California," and its purpose is to forward the interests of the hunters. The president of the Association is Carl F. Johnson; its vice-president is Nathan M Moran. Mr. Moran has been a member of the Advisory Board, Migratory Bird Treaty Act, since

1933. In publicity of November 12, the association gives its members a reassuring statement intended to demonstrate the ability of the organization "to negotiate with Federal agencies in behalf of sportsmen," at the same time chiding them for lack of support.

We hereby thank the "Development" Association for this compliment to the American Nature Association and its partners in the battle to save our endangered waterfowl. Without the birds, even this hunting cannot be perpetuated. Perhaps "perpetuated" is not the word the Development Association meant to use; it looks as if the intention is merely to keep up the killing until the birds are destroyed. On many occasions before, Mr. Moran has demonstrated his zeal in battling for sportsmen's privileges, both in and out of Advisory Board meetings. His value to the "development" association would seem to lie in his ability to pass on to its members cleverly worded opinions that will encourage hunters to take advantage of all technicalities. As an example, in an interpretation of the no-baiting regulation governing the shooting season of 1935, Mr. Moran opined:

"Clearly there is nothing in the regulation which forbids the rest-pond system, where all the feeding is done at a distance safely away from blinds." We are credibly informed that, as a result of this advice, most of the commercial and private duck clubs in southern California fed the ducks heavily as soon as they arrived, both on its resting ponds and on all water areas in an effort to hold the few that had survived to come south. For several years the ducks arriving in southern California have met with such a warm welcome that they have learned that their safest course is to keep on to Mexico. So it was desirable to induce them to stay in California as long as possible.

From various sources we learn that the supply of waterfowl in California during the hunting season of 1935 was very disappointing. Surely the warnings voiced by conservationists cannot be blamed for this condition.

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WALTONIANS HOLD ANNUAL MEETING

We attended the annual convention of the Izaak Walton League of America at Chicago, April 16-18. The significance of the meeting lay in the fact that it had a real conservation program to work for and the delegates present were able to report actual progress. The League's principal objective for the past several years has been the elimination of stream pollution, and, particularly within the State of Indiana, Waltonians have secured legislation with real teeth. The trouble in most other regions, however, is that industrial competition between states renders it almost impossible for any single state to be the first to act, and for that reason the national I. W. L. A. convention went on record in favor of national legislation to set up district boards covering each of the country's watersheds. Legislation of this type is the Lonergan Bill (Senate 3958), a bill which, although as yet slightly imperfect as to detail, nevertheless represents in principle the most practical solution of the problem, and deserves the support of all true conservationists.

Our own William L. Finley, who is also a vice-President of the I. W. L. A., keynoted at the convention, calling attention to the probable destruction of the two-hundred-million-dollar salmon industry in the Columbia River as a result of the great irrigation and power dams projected and being built as Public Works. Subsequently, Mr. Frank T. Bell, head of the Bureau of Fisheries of the United States Department of Commerce, attempted to oppose Mr. Finley, not upon facts, but by the well-known inferential method of implying that anyone who criticized the new dams in the Columbia must be playing into the hands of a selfish power trust. It occurred to us that the complacency with which the Bureau of Fisheries seems to view the danger to our food fishes is but another argument in favor of getting our Government conservation bureaus centralized under a single Director of Conservation of Renewable Natural Resources. This done, such directly contrary projects of so-called conservation could be coordinated from all angles before they are undertaken in the first place.

Aldo Leopold spoke forcefully and well in presenting the problem of vanishing species and again proposed a working inter-government bureau committee to save one of the last refuges of the ivory-billed woodpecker. This area is scheduled to be destroyed.

We were impressed by the high standard of sportsmen delegates to the I. W. L. A. convention. If there were any "killers" present, they were, for once, conspicuous by their silence. There is no doubt that the term "sportsman" can mean good clean sportsmanship and Waltonians will be among the coterie of those who believe in playing "a militant part in the attainment of constructive conservation aims".

Lastly we listened to a splendid talk on the really fundamental objective of the League—the preservation of the out-of-doors as a means of developing a constructive outlet for the energies of youth in answer to the urban breeding places of crime. In this respect the League is also a practical "service" organization, whose chapters and members are committed to actions as much as words in initiating boys into the fascination and charms of fishing, camping and the lure of Nature, rather than the other kind of "wild life".—A. N. P.

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PHOTOGRAPH BY N. J. MCDONALD

A GROUP WATCHING THE MIGRATION OF RAPTORES AT HAWK MOUNTAIN SANCTUARY
Now the birds pass this vantage point with binoculars trained upon them instead of the muzzles of guns that blazed with death every year

HAWK MOUNTAIN SANCTUARY

A significant object lesson in behalf of our birds of prey

By MAURICE BROUN

A PAIR of huge dark wings appeared over the sharp crest of the ridge at Hawk Mountain Sanctuary. Another moment and a great bird was before us. It pitched into the wind, stopped short, and hung motionless in mid-air, only a stone's throw from our rocky lookout. The November sun spread over the broad pinions, and over golden feathers that adorned a stately head. A small group of people stood spellbound, peering at the bird through binoculars, and then the silence was broken by an awed voice, which murmured "a golden eagle!"

Something in the way of a potential meal in the woods below held the eagle's rapt attention, and it continued to hang motionless. Presently a goshawk, a splendid adult, brought up its gray sails almost directly beneath those of the eagle, and it too riveted its attention on the problematical something in the brown woods. Both birds balanced on the breeze during an eternity of breathless seconds. That the woods offered nothing, however, seemed to be the joint decision of His Majesty and his satellite; we watched both birds renew their journey together. The few observers breathed deeply now, and each declared that they had never seen anything in birddom quite so impressive and novel.

Hundreds of bird lovers at Hawk Mountain Sanctuary have been electrified and inspired by sights such as this. It has been a revelation to many of these people that golden eagles and bald eagles, duck hawks and goshawks, and eleven other species of hawks may be seen and studied so easily from this mountain ridge, over which great numbers of these birds migrate. Nature lovers everywhere owe a debt of gratitude to Mrs. C. N. Edge, chairman of the Emergency Conservation Committee, for having made possible these thrilling experiences.

Had the meeting of eagle and goshawk taken place in the fall of 1933, neither bird would ever again have flown down the Kittatinny Ridge. For both were well within range of a shot gun; perhaps a score or more of gunners would have hailed the birds with a blast of missiles. Thousands of raptorial birds, from the magnificent eagles and buteos to the little sparrow hawks, met a tragic end year after year in the death-trap that once existed at Drehersville, Pennsylvania. Perhaps you have read about the wanton destruction described in NATURE MAGAZINE for February, 1934.

It is true that the golden eagle is sometimes destructive to man's interests; true that the goshawk is the arch-predator—a winged bullet of sudden death to the hapless creature that crosses the bird's pathway. "Feathered outlaws" is the brief, sarcastic verdict of those who seek with gun that which the raptores seek with talon. We pride ourselves on being a fair and bounteous people. Still, there are many among us who would rather see the raptores wiped from the earth than allow the birds to enjoy their small portion of it. On the other hand, there are in our midst many people who cherish, who are elevated by, the sight of those broad wings, which epitomize freedom, and the wilderness, and ethereal gran-

deur. And alas for the fiery spirit of the goshawk that few sensate men are able to appreciate and tolerate the bird. To the man with a gun the goshawk is anathema; to the biologist the bird has significance—a place in Nature. To the bird lover the goshawk represents unspeakable strength and action, an exhibition of grace and beauty the sight of which he will journey many miles to see.

The most outstanding hawk-flight of the past season occurred on September 17, when the following birds were counted as they passed over the mountain: 15 turkey vultures, 70 sharp-shinned hawks, 32 Cooper's hawks, 4 red-tails, 978 red-shoulders, 2175 broad-wings, 2 bald eagles, 3 marsh hawks, 13 ospreys, and one sparrow hawk —a total of 3293 birds of prey. More than half of these birds went over during the morning, flying rather low. Had the guns of old been roaring, hundreds of the birds would have been slaughtered—in the name of "sport!" The greatest numbers of victims would have come from the ranks of the broad-wings and the red-shoulders, both of which, as rodent destroyers, are of inestimable value to the farmer. This might have happened, and until very recently it did, on nearly every day during the fall migration, for more than a score of years.

Field glasses and cameras have supplanted guns at Hawk Mountain. More than 1250 bird lovers and conservationists visited the place during the past season (September to December) to see the hosts of migrating hawks. These folks registered from twelve states and from four foreign countries. It is probable that more Nature lovers met at the Sanctuary during this, its second season, than did hawk-hunters (all of whom were more or less local) in the days when the mountain was a shambles. The sanctuary and its visitors is not without significance. Too long have the hunters taken unto themselves the rôle of arbiters of our wildlife, decreeing what shall live and what shall not live. But this can no longer be tolerated, if the lesson of Hawk Mountain Sanctuary means anything.

The experiment in hawk-conservation carried on at Drehersville is unique. What effect has this experiment had on the people of the surrounding countryside; on the people of the region as a whole? Hawk-shoots still take place along the Kittatinny Ridge; at spots generally much less favorable for them than at Hawk Mountain, however. But we have reason to believe that these shoots are on the decline. The protection accorded the birds here has opened the eyes of many residents of the region. It was most heartening to find an open-minded attitude among many persons who until recently entertained inimical feelings towards all birds of prey.

One cool morning in October a burly gentleman from Pottsville, a business man, called on us at the Sanctuary, his mission being to get whatever hawk-conservation literature we might have. Imagine our concealed delight in this man's reformation when we learned by his own confession that until a year ago he was a killer of hawks on these very grounds! An automobile mechanic from Hamburg, also a quondam hawk-hunter, declared that he was glad to have become informed of the true status of this misunderstood group of birds. And another gentleman from nearby Orwigsburg admitted that he had given up shooting hawks because "there wasn't much sense in such sport anyway." Extremely encouraging was the action of certain high school teachers in Reading, Frackville, and Hegins—cities within twenty-five miles of the Sanctuary—who adopted the use of the Emergency Conservation Committee's well-known teaching units in their classes. The itinerant butcher, a mouthpiece for the dissemination of all manner of news throughout the valley, had ideas of his own regarding hawks, but these he discarded upon reading some pertinent literature that we gave him.

Most gratifying was the changed sentiment among the folks of Drehersville, who during our first season felt embittered towards the "meddlesome outsiders." The change of feeling is reflected in the Drehersville lad who, along with other local men, insisted on shooting the hawks along the border of the Sanctuary. There was no border-line shooting this year, and the boy, who lived at the foot of the mountain, became a real friend, making frequent visits to the lookouts—with a pair of borrowed field glasses!

A conspicuous and notable example of hawk protective work, inspired directly as a consequence of the crusading at Hawk Mountain Sanctuary, was that which was instituted in the early fall by the Pennsylvania Department of Forests and Waters. This was to the effect that killing of hawks was prohibited from the 140 fire towers scattered over the State. In addition, each fire tower observer received enlightening literature concerning the economic status of the birds in question. As many of these towers are located on ridges over which migratory movements of hawks take place more or less, this action on behalf of the birds cannot be commended too highly.

We may be grateful that a saner, more tolerant attitude towards our raptorial birds is spreading through the country. The educational work of the Audubon Societies, the Emergency Conservation Committee, the American Nature Association, and many local organizations is advancing nobly towards averting in this country the sorry condition that prevails in England, where the avifauna is impoverished by the removal of nearly all hawks.

Following is the list of the 15,766 hawks that were recorded at the Sanctuary during the season of 1935: 374 turkey vultures, 293 Eastern goshawks, 4237 sharp-shinned hawks, 553 Cooper's hawks, 4024 red-tailed hawks, 1868 red-shouldered hawks, 3772 broad-winged hawks, 9 rough-legged hawks, 66 golden eagles, 67 bald eagles, 153 marsh hawks, 169 ospreys, 14 duck hawks, 20 pigeon hawks, and 123 sparrow hawks. It is our hope that the succeeding years bring ever-increasing numbers, not only of these our charges for posterity, but of humankind who will come to feel the vital gladness which complements the understanding and practice of the simple philosophy: "Live and let live."

Crophobia, An Infectious Disease

THE United States has run along pretty well some one hundred and fifty years, and organized bodies of men have been in the country about twice that long without ever before experiencing a mass attack of the particular hysteria known as crophobia. In the year of grace, 1935, however, with no lack of more important things to ponder, such a mania has spread widely among sportsmen and their organizations, inspired action by state legislatures, and even made itself felt in the Federal Congress.

Colonists sometimes had to do something about crows in their corn, and farmers have occasionally been impelled to kill dusky egg stealers, but these have been individual actions; there was done what needed to be done and the matter forgotten. Individual defense probably would still serve in most cases and in others reasonable and thoroughly supervised remedies should be employed. Instead, we have hysteria and mob action. State-wide crow-killing contests, regional side hunts, and roost-dynamiting parties, are some of the manifestations of crophobia, and proposals have been made in every hopeful quarter for that most fraudulent of all control procedures, the payment of bounties from public treasuries.

Banqueting upon crow has been ballyhooed in an attempt, by force of example, to establish the use of crows for human food. These proceedings come near to giving the so-called worst enemy of game itself the status of a game bird. It was probably in entire innocence that the crow banqueters revealed their conviction that the most effective way of reducing the numbers of a species is to treat it like a game bird.

Attempt has been made to dignify crow shooting by individuals by establishing it as a branch of sport. It is questionable just what luster that action could throw on any undertaking and in view of what is actually done by some crow shooters no conceivable effort can sweeten the performance to such an extent that it will not remain a stench in the nostrils of decent people.

In a recent sporting magazine an advocate of individual crow shooting blandly tells us: "We shall assume that you are in a deep woods on a beautiful summer day—one of those soft transcendent days that makes you feel glad you are alive. . . . [You may see a young crow also glad to be alive.] It is an easy mark for the rifle, but you will be in luck if you only break a wing. Down it comes flapping and cawing. Its plaintive cries will attract all its buccaneer friends and relatives. Daddy and mother crow will come closest. . . . Here is where you can get in some deadly work with the rifle. . . . But you must know how to handle the crippled young crow to get best results. It will not caw all the time. Often it will slow down when you want it to make the biggest fuss. So tie it by the leg to a chunk or bush, then keep stirring it up with your foot. This will make it set up an incessant din. . . . Occasionally one is lucky enough to break the wing of an old crow. . . . Although a wounded young crow is, in my opinion, the best decoy possible to secure."

How can men persuade themselves that long drawn out cruelty to crippled crow decoys is justifiable? Apart from a falsely assumed distinction between man and beast the immediate reason is that the hunters believe that crows devour some of the eggs and young of certain game birds. Crows, therefore, are "vermin"; they kill before the hunter can; they get what he covets. So they must be destroyed. When crow killing is carried on in the manner described or in any other involving inhumane methods, it can only be regarded as cruelty. It is perpetrated, moreover, with the idea of improving hunting that is—as leading to increased killing of game species with further attendant cruelty. This is certain, for hunting always involves cruelty, not only through the chase itself, but also because of the loss of cripples, known to average a third or more of the total game brought to bag. The use of wounded and tormented crows for decoys therefore is cruelty premeditated, cruelty preparatory to future cruelty. It can be judged, therefore, only as a deliberate and cold-blooded crime against Nature. Like many another manifestation of "vermin" control it can arouse only disgust and incur only condemnation among humane people.

CONTRIBUTED

CONSERVATION LEAFLET

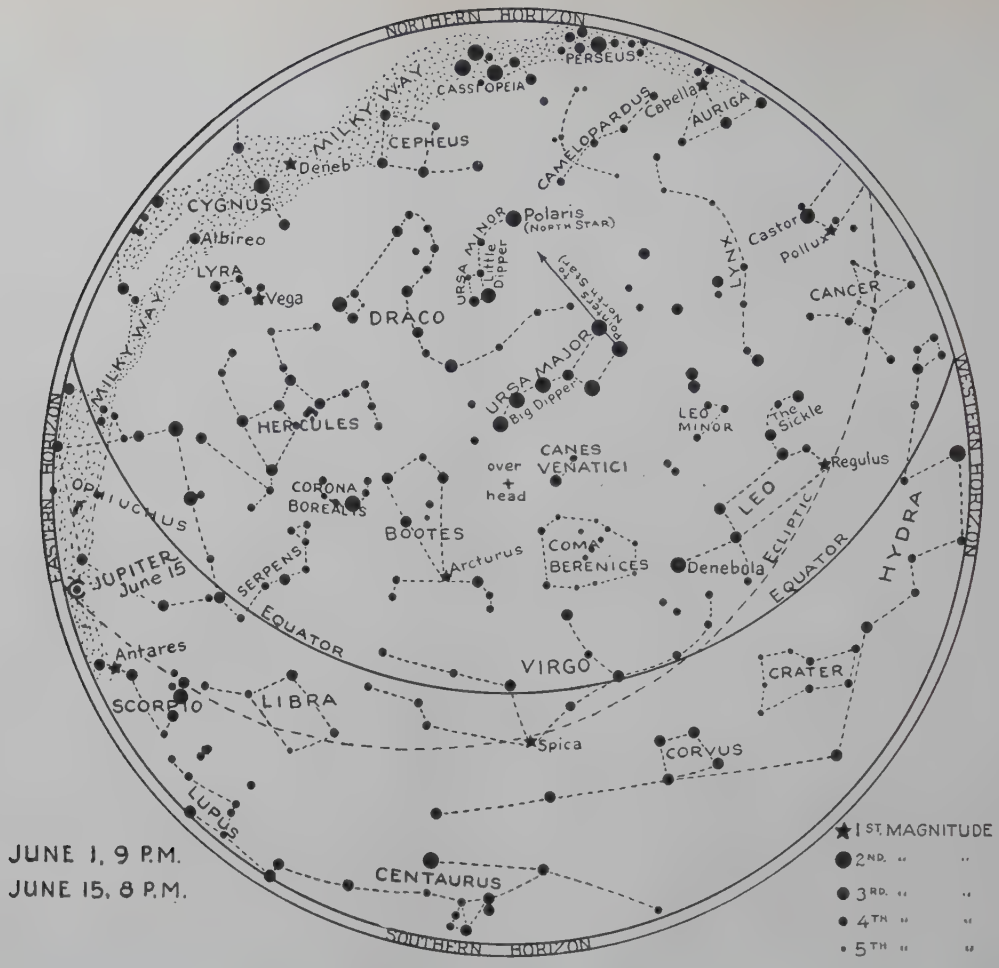
Conservation, Cornell Rural School Leaflet, Volume 29, Number 3, is published at Ithaca, New York, January, 1936. It is prepared by E. Laurence Palmer, Professor of Rural Education at Cornell.

If every rural school in every state could have a leaflet of this nature for the use of its teachers, we believe that the children now in school would grow up better prepared to handle our natural resources.

Dr. Palmer begins by showing that conservation, or *wise use,* should be applied not only to birds, plants, minerals, lands, water, soil and all other earthly possessions that are loaned to us, but to our playthings, mental and physical powers, and to our time. The use of natural resources for the benefit of all the people is properly stressed. Even the uses of the automobile and the radio come in for their share of attention. We are glad to see that he points out some of the disadvantages of having a radio always in our ears, insistently trying to tell us what to eat, drink and wear; how to move, stand, sit and travel; how to think and vote; trying to influence the use of our time; and suggesting nearly everything that may be the matter with us, and how to cure it or make it worse. The result is often a tendency toward careless thinking.

While each of our forty-seven other states are looking for a final textbook on Conservation, they might do worse than to get permission to reprint this one. It is good for all states, even states of mind.

E. A. P.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Saturn Stripped of His Rings

By ISABEL M. LEWIS

AN UNUSUAL opportunity will be presented this month to see the planet Saturn without his rings for about two weeks late in June and early in July. Even the smallest telescopes will show this interesting phenomenon, which happens at intervals of fourteen or fifteen years when the earth is in the plane of the rings, which is also the plane of Saturn's equator.

The rings are seen at their widest opening when the earth is farthest above or below the plane of the rings seven and a half years before and after the time when it lies in their plane and they temporarily disappear from view. As the rings always remain parallel to themselves as Saturn moves on in its orbit around the sun their position with respect to the earth, and the angle at which we view them, are constantly changing. Because they are so thin, the rings actually disappear from view when they lie edgewise with respect to the earth.

As the sun and the earth are on the same side of the plane of the rings nearly all of the time, it is the side that is illuminated by the rays of the sun that we usually see. The only exception to this may occur for a few weeks when the earth is very close to the ring plane. Then a strange reversal of the rings is observable. The earth may then be on the dark side of the rings and the sun on the opposite side. Then the rings will be illuminated by the light of the sun, but will be invisible to us. There are divisions in the rings, however. The rays of the sun will pass through Cassini's Division, which is about 2,000 miles wide, since they contain few, if any, of the small meteoric particles of which the rings consist. Also the inner, dark, or crêpe ring will at this time transmit the rays of the sun and appear bright instead of its usual dusky color because it is so nearly transparent and contains so few particles of matter. The outer ring, known as Ring A, and the middle, or brightest, ring, known as Ring B, are composed of such dense swarms of tiny

moonlets that they are opaque to light and appear dark when the earth and sun are on opposite sides of them.

The thickness of the rings, it has been estimated, is probably not over ten miles, though their extent from the outer edge of the outer ring on one side of the planet to the outer edge of the same ring on the opposite side of the planet is about 171,000 miles. Little wonder, then, that at the times when the earth is in their plane they disappear from view completely for a few days even in the most powerful telescope!

For the earth to complete its crossing from one side to the other of the ring plane requires about a year. During that period it may cross the plane once or three times or it may come down into the plane, return to the same side without crossing, as it does this month, and then, some months later, make a final crossing to the opposite side on which it will remain for another fifteen years. During all of this year the rings will be seen at a very small angle from the earth and for much of the time they will be merely a thin needle-like line of light.

The last time the rings disappeared from view was early August, 1921, when the earth crossed from the south to the north side. In the preceding year early in November a first crossing from the south to the north side had been made. For several months the sun and earth were on opposite sides of the ring plane, then, on February 21, 1921, the earth again crossed the plane and remained on the south side for about six months before it made its final crossing, and the rings disappeared temporarily for the third time within a year, in August. From that time to the present it has been the northern side of the rings that has been visible from the earth.

On June 30 the earth will lie exactly in the plane of the rings and they will be turned edgewise to us. It will then return to the north side again for the remainder of the year, but during that time the rings will be viewed at such a small angle that they will appear like a thin line of light. At the beginning of next year the sun will be on the opposite side of the rings and we will see the dark side of them until late in February when the earth will cross from the north side to the south side, where it will remain for the next fifteen years. There will be another temporary disappearance of the rings in February of next year, therefore, when this crossing occurs.

The surface of Saturn is generally concealed to a greater or less degree by the rings. Their obstruction of our view of the planet is greatest when they are at their greatest opening and least when the earth is in the plane of the rings. The planet then has a most unusual appearance. Its flattening, which is the greatest by far of any planet, is very noticeable at this time, as are also its belts and other surface markings.

To see the planet to advantage at the time of the disappearance of the rings one must rise an hour or more before the sun or be up after midnight. On June 13 Saturn will be in quadrature with the sun and will then rise at midnight and be on the meridian due south at sunrise. After that date it will rise before midnight but will be best seen for the entire month well after midnight, when it has attained a considerable altitude above the horizon. It will be in Aquarius and will rise in the southeast. In brightness it is now a little less brilliant than Regulus or Spica and is a pale yellow in color.

Jupiter is now in fine position for observation. It will be in opposition to the sun on June 10 and will then be visible all night in the constellation Sagittarius. Mars and Venus are both too close to the sun to be seen this month. Mars will be in conjunction with the sun on June 10 and will then pass to the morning sky. Venus will be in superior conjunction with the sun on June 29 and will then pass into the evening sky.

Mercury will be a morning star throughout the entire month. Its greatest western elongation will occur on June 25 and it should be visible in the morning twilight in the latter part of the month. At elongation on June 25 it will be close to the first magnitude star Aldebaran in Taurus.

Of exceptional interest this month will be the total eclipse of the sun, visible in Eurasia on June 19, attracting a number of eclipse expeditions from this country and abroad. Partial phases of this eclipse will be observable over practically all of Europe and Asia as well as Alaska, northern Canada, the north polar regions, and the northeastern part of Africa. The maximum duration of the total phase of the eclipse will be about two and a half minutes and it will occur at noon near the town of Bratsk in Siberia. The path of total eclipse will first touch the earth's surface in the Mediterranean Sea at sunrise southeast of Sicily, and will cross the Grecian peninsula, just grazing the town of Athens, shortly after sunrise. It will then cross the Ægean Sea, the Sea of Marmora, the Black Sea, and part of the coast of Asia Minor, and will continue its course over the Kirghiz Steppes north of the Caspian and Aral Seas, where conditions should be favorable for observing the eclipse in the early morning. A number of expeditions will probably be located in this region. Weather conditions promise to be less favorable in central Siberia where the path will pass over a number of towns on the Trans-Siberian railway. It will finally pass over the northern coast of Hokkaido in Japan in the afternoon and will pass off the earth at sunset in the north Pacific.

It is expected that a number of expeditions will be located in Japan as well as in the U.S.S.R. and it is hoped scientific observations and photographs of the solar corona will be obtained that will be of value in the solution of a number of scientific problems.

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Trailside Treasures

THE MYSTERY BEGINS

By JANE ADAMS PARKER

"Surprise! Surprise! Look who are coming!" sang Jo, as she ran around from the side of Grandpa Arnold's house.

Rosy and Jerry jumped up from the wooden swing and skipped across the lawn to look. Mrs. Knight came into the yard pushing Jackie in his wheel-chair. "I thought I'd bring Jackie over to have a little visit with the baby birds while I went in to talk to Mrs. Arnold," said Mrs. Knight.

"There are three of them," said Jerry. "See how they stretch their necks for something to eat."

"Wasn't it terrible that the poor mother robin was killed with that sling-shot?" asked Jo. "She fell right in the path before us as we started down the short-cut home."

"The babies might have starved to death if Jerry hadn't heard them peeping, and climbed up the tree and brought down the nest," added Rosy.

"I wonder if this is what killed her," said Jackie, holding up a broken sling-shot, as his mother went into the house. "I saw it by the path, and mother picked it up. It has the initials 'D.D.' on the handle. Do you know anyone with those initials?"

"D.D." Jo repeated, thoughtfully. "There's a Dickie Dole in our room. But I know it couldn't be Dickie. He's kind and nice to everybody."

"We might have the finger-prints taken," laughed Jackie.

"I told Miss Horner, our teacher, about it," said Jerry. "She talked all the Nature half-hour about our wild friends, and how cruel it was to hurt or kill them."

"Don't you remember the mother owl someone shot?" reminded Rosy.

"And Ricky, the raccoon that we found caught in a trap?" said Jo.

"Well, there's one thing," Jerry said solemnly, "we'll have to find out who is doing all this."

The children were quiet for some time, watching Jerry feed the orphaned birds. Then suddenly Jackie broke the silence by saying gayly, "My 'Seeing Eye,' doth spy a fly. There—on the back of the swing. It has gauzy wings and a long body with threads sticking out of the tip." He pointed and they all looked.

"That's a Mayfly," said Jerry. "It comes out of a speckled little grub that lives down in the mud at the bottom of the water for over two years sometimes, before it changes into the fly."

"Then the little fly only lives for a few hours," went on Rosy. "Hasn't it funny little round eyes? But it can't eat, because it hasn't any real mouth."

"The grubs have big, strong jaws for snapping up

the other little water insects," said Jo. "And some kinds eat water plants."

"How does the grub get down in the mud?" asked Jackie.

"I know," thrilled Jo. "The mother fly drops some little packages of eggs, as she flies over the water. These separate when they reach the bottom and after a while the eggs hatch out into the grubs. I'll run into Treasure House and get some books with pictures of dragon flies and things. Jackie can take them home."

Jo started off toward the garage on the run, but came back in a moment with a puzzled look on her face. "I thought I heard something rustling in those bushes back of the garage," she said. "So I tip-toed around to see. A tall boy went bounding off through the woods."

"Crickety!" said Jerry, "the mystery begins. Let's go look for clues."

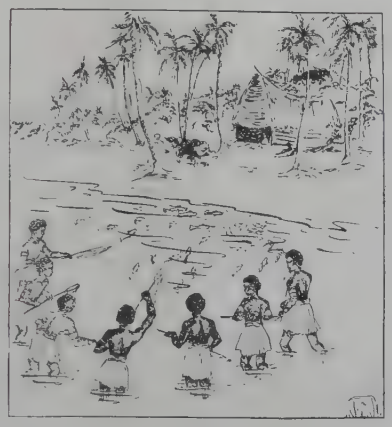
With Jerry wheeling Jackie's chair, they had just reached the bushes when a little girl came into the yard. She had two shiny red braids hanging down her back and a turned-up nose adorned with freckles.

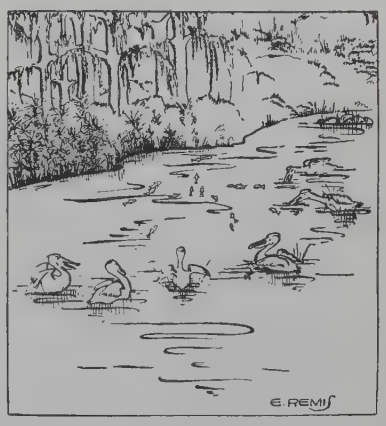
"Have you seen Tommy?" she inquired. "Mother wants him, and some boys said he came this way." Then, as she saw the sling-shot she broke into a giggle. "Where'd you get the old sling-shot Tommy threw away?" she laughed. "Wasn't it funny? Donald Dawson traded it to Johnny Barlow for some marbles, and he gave it to Tommy for a pigeon's egg."

"And look at these big foot-tracks in the earth by the bushes," said Jerry turning from the group to examine the ground closer. "Someone WAS standing here listening to what we were saying."

(To be continued)

Can you help the treasure hunters solve the mystery of who had been harming the little wild friends? If you think you have a suggestion to help them find the guilty one, send it to Uncle Dick. Who was the tall boy that was listening to their talk? Uncle Dick would be glad to have you write to him about this too.





The Wise Pelican

By CLARENCE M. WEED

THE PELICAN is one of the most interesting birds in the world. It is the largest of all web-footed birds. It is famous for the great pouch below its lower jaw. This it uses as a net to catch and hold the fishes that serve as food for both old and young.

In the tropical lagoons of South Sea islands the natives long since learned to join in driving fishes toward land. Many men enter the water to form a partial circle. Then they move forward, splashing about with hands and nets in a way to drive the fishes to the shallow waters of the shore. Then the natives make rich hauls.

Perhaps the natives learned this way of fishing from the pelicans. The birds did this millions of years before men lived upon the earth. These great birds form in lines or circles upon the water and then move forward, flapping their wings as they go. The fishes are driven into shallow waters where the birds fill their great pouches with them.

The pelican pouch is the food table of the young birds. Mother Pelican brings her head down within reach of the youngster. Then she opens her mouth wide to let the little one push in its beak and get its meal. Thus the young of our bulkiest bird is nourished as is the tiny hummer.

Nature Magazine in School

A Department of Aid to the Teacher

In order that teachers and parents may further use Nature Magazine as an aid to the study of Nature and Science, this page is devoted to the following brief notes based upon articles in this issue and suggesting ways in which they may be used as a source of inspiration and information. To bring these Nature study thoughts to our readers we have obtained the services of one eminently qualified for the task, and this department is edited

BY ESTHER SCOTT

**Instructor in charge of Elementary Science
Washington, D. C., Schools**

An Aquatic Rabbit

By comparing the structure and life history of the rabbit described in this article with those of the cottontail and jack-rabbit it would be possible to present the idea of the variations found in the various species of rabbits and to show that each type is found in the environment in which it is best fitted to live.

Rabbits make such delightful pets and small children in the lower grades get such joy out of caring for them that it would be a desirable thing for more teachers to have them in their classrooms. Aside from the gaining of first hand information regarding the activities and adaptations of the rabbit, the care which these pupils bestow on the rabbit will develop their sense of responsibility and awaken a sympathetic feeling toward other living creatures. All of this will be a decided contribution towards character education.

A Prison Friendship

This article suggests that to some extent it may be possible to train cats not to hurt birds. However, this can only be done when the cat is a kitten, a very young kitten. Care must be taken that the kitten does not acquire the taste for bird flesh while it is being fed by its own mother. Some cat owners claim to be able to train kittens by punishing them every time they move toward a bird. In order to avoid exceptions the kitten must be kept in some comfortable place and only permitted to run at large when it is under observation.

One of the most serious aspects of the bird and cat situation is the abandoned cat. This June many families will spend the summer in camps and cottages in rural sections. Accompanying these families there will be many cats left in the summer homes when the families move back to town. These starving animals have to kill to live and they create havoc among the wild creatures. June, just before vacations begin, is a most important time to study the relation of the house cat to our vanishing wild life. In introducing such a subject this article could be used to advantage. Lessons that follow should bring out the economic value of birds, the great numbers of birds killed by cats, the danger of some species of birds becoming extinct and the importance of preserving species threatened with extinction. No one can foretell how seriously we may need the services of some species after the last one has been killed.

Pianos for Ears

The study of insects is one not only important for pupils to undertake, but it is one in the pursuit of which they can derive much satisfaction. The time to begin it is in the early grades when children ask questions about insects. From the kindergarten through the junior high school, observation cages for insects add a note of interest in many classrooms. In the lower grades children are interested in the actions of the insect such as hopping or running, and in the noises that these creatures can make. In the upper grades, using this interest in activities of insects as an introduction, pupils could be led to investigate something of the anatomy that makes these actions possible. When such "researches" are undertaken this article would be quite useful in answering questions regarding the types, the location and the structure of insects' ears.

Living Matter in the Air

This very interesting article could be used in connection with a study of bacteriology as well as one involving the weather.

In beginning this study of living organisms found in the air, it might be possible for some pupil to put a medium for growing bacteria in a sterile petri dish, and after covering the dish so no bacteria could enter prematurely, carry the dish to the top of some high building. By removing the cover, the dish could be exposed to the air for ten minutes and then the cover replaced. If a similarly prepared petri dish placed on the ground were exposed to the air simultaneously for ten minutes, the results might show that fewer bacteria are found at higher elevations. This would lead to such questions as: What is the greatest elevation at which living organisms have been found? Has any elevation been found where there are absolutely no living organisms? How do these organisms reach such elevations? How are these records obtained? Of what significance are these records to us? What type of organisms has been discovered?

Hawk Mountain Sanctuary

It is encouraging to read of conservation work which is actually being done. Hawk Mountain Sanctuary is an example of what can be done by one public-spirited woman.

The economic value of birds of prey is a subject about which much wrong information has been and in fact still is being disseminated by groups interested in the sale of guns and ammunition, and by various other misinformed people. In consequence, it is possible that even in those school systems where the curriculum provides for bird study, that the destruction of birds of prey may be encouraged. This is a question that citizens interested in conservation should investigate in their local communities.

In presenting this question to pupils, there is no better way than to have a tame hawk at school. By caring for him pupils would come to appreciate some of his adaptations and habits, which would lead them to have a more tolerant attitude toward all birds of prey.

The course of study should provide for learnings such as those suggested under the mourning dove in the November, 193[illegible] issue of NATURE MAGAZINE.

Saturn Stripped of His Rings

Now that the weather has become warmer a series of excursions may be made to observe the objects in the sky. In this way much worthwhile information concerning the stars and planets may be obtained first-hand. It is interesting to see in which constellation a given planet is at the same time on different nights.

JUPITER, which is now located well for observation—see article on page 370 of this issue—always attracts attention because of its size.

The interesting account of SATURN's rings given in this article should be read in the upper grades of the elementary school and beyond.

SATURN is of particular interest to pupils. They ask many questions regarding the size of and the materials composing the rings. In explaining why at this particular time we cannot see the rings they could put a cardboard ring around an orange and then, moving the orange and ring up and down, they could observe the changes in the appearance of the rings as these passed the line of vision.

As SATURN is now one of the morning stars, some pupils may observe it.

This would be an interesting time to present eclipses. In dealing with this phenomena pupils should realize that this is a regular occurrence, happening as the earth and the moon revolve about the sun. Eclipses may be easily illustrated with two spheres, one larger than the other, and a bright light. The larger sphere, representing the earth, the smaller one the moon, and the light the sun. If the room is somewhat darkened and a very bright light used, pupils can see the shadow of the "moon" cast upon the "earth" as the former crosses directly between the earth and sun. This device could also be used to explain why only certain parts of the world see the total eclipse.

"Sergeant Finnegan," a Sea-lion

The delightful humor of this article will go far toward getting the moral across. It should be read by all pupils whom it would be desirable to interest in conservation.

It would also be very worthwhile to read in connection with a unit on fishing which is a part of the social studies curriculum in many sections of the country.

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PHOTOGRAPHIC NOTES

(*Continued from page 323*)

The *Korelle Reflex Camera* is one of the latest instruments to come to the attention of this writer. It is equipped with a focal plane shutter permitting speeds ranging from 1/25 to 1/500 of a second together with a choice of high speed lenses. Accessories include a telephoto lens, yellow filter, sunshade and carrying case. Compactness, light weight, and easily accessible controls are outstanding features. An illustrated leaflet giving details in full is available from this department.

* * *

Three Monographs On Color; The International Printing Ink Corp., 75 Varick Street, New York, N. Y.; Price $10.00.

Three Monographs On Color is a set of three books entitled separately *Color Chemistry, Color As Light* and *Color In Use.* Being one of the few treatises on the subject, the monographs are a boon to the scientific world. Color knowledge is rare and comparatively little research has been done to increase it. New investigations have led toward a clearer and better understanding of color. Chemists, scientists and physicists will find the books of considerable value in their work. Of particular interest to me was the many puzzling questions that the books answered regarding color. The outstanding feature, in my opinion, is the manner of presentation. One need not have an involved education in chemistry and physics to understand the books. As applied to photography, the *Three Monographs On Color* will be an invaluable aid to persons interested in pictures in natural colors.

The publishers of the *Three Monographs On Color* have prepared two interesting brochures in color and we suggest that you write for them for further information.

* * *

Despite the number of books written by H. Rossiter Snyder, he continues to be of assistance to the amateur photographer interested in making his hobby pay. Mr. Snyder's latest books, *More Camera Journalist Ideas* and *Profitable Photography for Trade Journals* are of value to the photographer because they embrace a field which has attracted many enthusiasts. As in all of Mr. Snyder's works, these books are instructive and to the point. Published by the Rossiter Snyder Publishing Co., 24 West 20th St., New York, N. Y. Price 50c each.

* * *

The photographic department of Nature Magazine is devoted to its readers interested in photography and maintains a service which renders assistance with any photographic matter. You are invited to take advantage of this service. Address all photographic inquiries to Samuel Brown, Nature Magazine, 1214 Sixteenth St., N. W., Washington, D. C.

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ACTUAL SIZE

Hiking and Camping Forum

Conducted by
ERNEST A. DENCH

Hiking and camping inquiries will be answered by mail if a stamped, addressed envelope is enclosed. Address the Forum editor.

This Forum is dedicated to the annual meeting of the New England Trail Conference, held at Massachusetts State College, Amherst, Mass., and the Hosts, the Connecticut Valley Trail Conference (John B. Dickson, president; and Mrs. Ernestine Perry, secretary-treasurer).

New Forum Publications

Pestiferous Months Ahead. A classified list of advertised remedies and antidotes for summer hiking and camping comfort and protection. Price 3 cents. *Camp Cookery and Its Preparation:* A bulletin giving food lists needed for overnight and vacation trips. Tells where camp recipe literature may be obtained and lists sources of supply of cooking utensils and accessories. Price 3 cents a copy to members, or 10 cents per copy to non-members.

New England Trail Conference

The oldest trail administration organization we have. A going concern for 21 years. . . . Fifty constituent groups, ranging from the New England Hotel Association to the National Park Service. It takes diplomatic skill to keep such a diversified membership happy and contented. . . . Chairman Edgar L. Heermance is a scholarly middle-aged gentleman, a dignified figure in the chair, and a polished correspondent. Dread of the important position ever becoming routine spurs Heermance to infuse the NETC with new ideas. . . . NETC has a financial reserve of over $400.00, used as a revolving fund for issuance of publications. Annual income equal to expenditures. . . . Goal Heermance is now working toward is a regional trail conference for each of the six New England states.

Forum Editor's Trail Trips

Saturday afternoon climb of Mount Holyoke, to view the Connecticut River ice jam. H. E. Warfel, Metawampe Club, was trekmaster. Largest delegation contributed by Worcester Section of Green Mountain Club, with Stuart B. Van Buren in command.

Sunday in the Southern Taconics with the Connecticut Chapter of the Appalachian Mountain Club. Delightful overnight sojourn at the Jug End Barn, unique rustic hostelry, originally constructed, at cost of $80,000.00, to house pedigreed cattle. Former AMC hut master is manager. Owned by Major Hugh Smiley.

Leader William H. Burling, a nimble Lancashire, England, lad, clad in shorts and shirt, giving his party—mainly young women—some Race Brook roughage. The brook lived up to its name, as spring thaw was under way. Having a long auto drive home, the main party (under a deputy leader) turned back after reaching the first waterfall in late afternoon. Four remained behind to clamber up the icy slabs to the second, and higher, waterfall. Forum editor's leather top rubber boots, due to corrugated surface of bottoms being in semi-smooth condition, failed to grip at times, and he was grateful for Burling's rope.

In particular does the Forum editor wish to thank J. Earle Bacon and Edward S. Spicer (both of Narragansett Chapter of Appalachian Mountain Club), and John H. Vondell (Metawampe Club) for their gracious hospitality in providing auto transportation, without which these trips would have been impossible.

Trail Developments

Connecticut (Edgar L. Heermance, State Chairman): Connecticut Park and Forest Association has 17 trail sectors, aggregating about 400 miles. All trails painted blue. An *Outdoor Recreation Guide for State Parks and Forests* is promised May first. *Connecticut Walk Book* slated for fall publication. *Connecticut Woodlands* is a new thrice-yearly periodical. Mail inquiries to P. O. Box 1577, New Haven, Conn. *Rhode Island* (J. Earle Bacon, State Chairman): Narragansett Chapter of Appalachian Mountain Club has completed one trail from Southern Rhode Island to the Connecticut border, as described in February Forum. A western fringe trail is contemplated in an uninhabited part of the state. *Massachusetts* (State Chairman to be appointed: Pressing need here is a clearing house of information, and newly-organized Connecticut Valley Trail Conference will function as such.

State forests contain about 200 miles of graded trails radiating from central recreational areas. NETC uncertain whether to rate them as paths or trails.

Massachusetts State College has a faculty organization, the Metawampe Club, 60 members. Schedules 8 to 10 hikes during college year. Owns a cabin on Mount Toby and maintains three miles of trail there.

Smith College Outing Club's principal trail interest is in the vicinity of its cabin near Whately.

Mount Greylock Ski Club attends to tramping trails in the area indicated by its name.

The work of the Berkshire School Outing Club has, of late, been confined to ski trails in the Southern Taconics. However, these wide swaths are useful to hikers in other seasons as both alternative and circular routes to and from the Appalachian Trail in the Mount Everett sector. The Jug End ski trail joins the A-T at Black Rock junction. A detour here is to the Bat's Den, said to be a remarkable cave. The Elbow trail is now provided with a loop. *New Hampshire* (Warren F. Hale, State Chairman): The White Mountains National Forest holds 946 miles of trail. A Mount Washington addition is the Jewel trail. There are also 90 miles of ski trails. Five new cabins, closed type, in high locations, for stormy weather use. At lower elevations 15 lean-tos are in process of construction.

Willingness to participate in trail maintenance work is an active membership requirement of the Chocorua Mountain Club. Spring week-ends are devoted to conditioning CMC trails for the benefit of those who climb Chocorua.

Society for the Protection of New Hampshire Forests has a new handbook on Mount Monadnock in the press.

Vermont (Willis M. Ross, State Chairman): Green Mountain National Forest, new NETC member, has 146 miles of foot trail. The Long Trail accounts for 60 miles of this, and will, as of yore, be the Green Mountain Club's responsibility. 86 miles of side trails, axe blazed, make up the balance. No new trails contemplated, although a few new ski trails were added this past season.

Green Mountain Club allots 20 miles of the Long Trail to each local section. An exception is the New York Section, custodian to the substantial extent of 40 miles. Nearly 50 lean-tos averaging six miles apart.

Maine (James H. Sawyer, Jr., State Chairman): The Bates College Outing Club has completed a side trail, blue blazed, that goes up "C" Bluff, a 1200 feet ledge overlooking "C" Pond, near Andover. On clear days a panorama of 60 to 70 miles may be obtained from the summit. The BCOC owns Thorncrag cabin on Sabbattus Mountain. The Saturday afternoon trips here draw turnouts of from 40 to 70.

The Maine Appalachian Trail Club has as its mission the completion and maintenance of the Appalachian Trail. It is receiving considerable assistance in man power from the CCC.

Ski Trail Problems

The inroads of ski trails were frankly discussed at Amherst. Decision was to steer clear of competitive aspects—one-hundred per cent downhill trails—solely useful by racers and stunters.

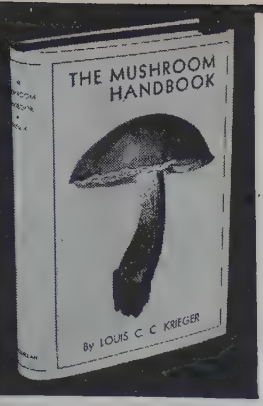
Those who love this winter sport for its recreational value are users of cross-country ski trails, which blend level going with downhills of easy grades. On such long routes, away from the swarms of spectators, solitude may be experienced in a semi-wilderness environment. Old roads make ideal cross-country tracks.

The NETC has a cross-country ski trail committee in process of formation, while a bridle trails committee is already in session.

The Connecticut Valley Trail Conference has decided to promote cross-country ski trails, in coordination with the Eastern Amateur Ski Association. Bicycle paths form another CVTC undertaking.

A-T in the Spotlight

The Appalachian Trail Through New England was the appropriate motif of the attractive booth exhibit in the "Cage" of Massachusetts State College. It was arranged by John H. Vondell of the Metawampe Club. . . . From Maine to Georgia, via the Appalachian Trail, in 1½ hours. Myron H. Avery wore a tuxedo while doing it for us. His stereopticon lecture deservedly got a big hand. (Continued on page 379)



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LIFE'S SHOPWINDOW

(Continued from page 332)

with minute gems of ruby, rose, burnt-orange, sunshine yellow and pinkish cream. Her wings were etched in sooty brown and washed with olive green and the long flight feathers were fringed with delicate pink-orange. The base of her deeply forked tail was checkered with yellow-green and golden bronze and brilliant burnt-orange, but a rosy flush mellowed each lovely hue. And then I counted nine wee feathers set in a perfect half-moon across the very top of her indignant head, and the nine feathers were like unto nine glowing rubies set in a green-bronze crown. The demure person of the little maid was adorned with all the glory of Sheba's queen—and I had thought her plain!

Yet when she left my hand and alighted on a nearby branch, she winked a knowing eye at me from beneath her lifted crest. A little drab bird was again what I saw; but the Knight's lovely Lady is what I remember.

Iris Pamphlet Ready

A taxonomic and ecological interpretation of the Irises of southeastern Louisiana, by Percy Viosca, Jr., has been reprinted from the April, 1935, bulletin of the American Iris Society. The reprint was necessary due to the numerous requests for copies, which now can be had from the Southern Biological Supply Co., Inc., New Orleans.

Florida Shore Fishes

A comprehensive pamphlet on the various species of fishes that inhabit Florida coastal waters has been prepared by the Cleveland Museum of Natural History. It contains information on 20 families of fishes and is available for 25 cents from the Museum. Ask for Zoological series number two, pocket natural history number five.

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The Young Folks' Page is more mature, its topics cover a wider range, it treats problems of which the older children have become aware, yet always with the idealism that permeates the Monitor as a whole. It also contains carefully selected fiction, poetry, articles on art, music, and allied topics.

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Aquarium Book

Although the title is *An Aquarium Book for Boys and Girls,* Alfred Morgan's new 180-page book is just the thing for anyone wishing to know the pleasures of having an aquarium in their home, be they youngsters or grown-ups.

Mr. Morgan answers fully all questions pertaining to the keeping of fishes, frogs, and toads in an aquarium as well as pointing out what plants and scavengers are necessary. Aquarium keeping, as a hobby, necessitates following certain rules that Mr. Morgan sets forth in a most readable way. The volume, priced at $2.00, is published by Charles Scribner's Sons, New York.

Nameless Lakes

Two new maps of the Grand Teton National Park, Wyoming, recently have been made by the Geological Survey, following a completed resurvey of the northern portion of this rugged wilderness. Approximately 100 new unnamed lakes were discovered during this project, which took the technicians into some of the most spectacular mountain scenery in the United States.

The Grand Tetons rise, without foothills, in jagged peaks of solid granite, and present a challenge to mountain climbers unequalled by any other of our mountain ranges.

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Don't Miss Wind Cave

Visitors to Wind Cave National Park, in the billowing hills of South Dakota, henceforth will enjoy the thrill of seeing big game herds roaming over 11,000 acres of range with no fence barriers to obstruct the spectacle. Several miles of the fence that formerly bordered the main highway is being removed by CCC enrollees and is being relocated around the park boundary, according to the National Park Service.

In very few places are the American bison and elk now seen outside of enclosures. This new method of presentation will enable park visitors to experience some of the excitement that must have animated the early settlers of the great West, when those noble animals were plentiful. Estes Suter, ranger in charge of wildlife at the park, always points out to visitors that the name "buffalo" should not be used to designate the American bison, one of our most distinctive big game species. The term buffalo is properly applicable only to a group of bovines native to the East Indies, Asia and Africa. Our bison, however, has a close relative now represented only by a few small herds in northern Europe.

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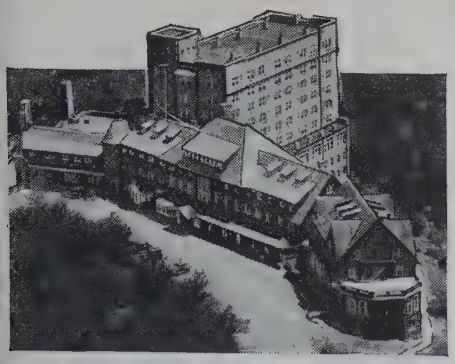

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Hiking and Camping Forum

(Continued from page 376)

The Southern Taconics

The Southern Taconics take in corners of New York, Connecticut and Massachusetts, in an area about twenty miles long by ten miles wide. The characteristics are dark ravines, steep forested slopes and rocky cliffs.

Some of the 23 mountains attain elevations of over 2000 feet. The peak parade is headed by Everett, 2624 feet, and the second highest in Massachusetts. Guider Pond, 2000 feet, is Massachusetts' highest body of water. Connecticut's lofty limit, Bear Mountain, 2355 feet, is also here. New York offers spectacular Bash Bish Falls.

Part of the region composes the Taconic State Park, at the recreational center of which tents and cabins may be rented. There is also the Mount Everett Reservation. The Appalachian Trail is "fed" by a side trails system. 121 miles by auto from New York City. Rail service by branches of the New York Central and New Haven. *Trail Data:* Southern Taconics blue print map, new, based on 14 different road, county and trail maps, 25 cents from William Hoeferlin, 556 Fairview St., Brooklyn, N. Y.

Guide to the Appalachian Trail in New England. New England Trail Conference, P. O. Box 1577, New Haven, Conn. 50 cents.

Guide to the Mount Everett Trails. Combined folder and map. Send a stamp to Mt. Everett Reservation Commission, Great Barrington, Mass.

New York State Parks. Free booklet. New York Conservation Dept., Albany, N. Y.

Taconic State Park Trails map. Send a stamp to New York Central Lines, Grand Central Terminal, New York, N. Y.

A week-end hiking trip in the Southern Taconics is on the books for late May, under the auspices of the Hiking and Camping Forum. Forum editor will, if the demand warrants it, organize a Columbus Day week-end here, using the Jug End Barn as an overnight base. If interested, write the Forum editor.

June Gadget List

1. Camp cookery outfit (aluminum) for two; nested; zipper bag container. The six pieces, when packed, stand 5½" and weigh 3¾ lbs. Room inside "nests" for a few small accessories. Outfit does not include cups or cutlery. Proved a versatile outfit on Forum series of winter hikes.

2. The latest for the ladies is a washable sport ensemble of shirt and shorts, with a separate wrap-around skirt which buttons in front.

3. A new pocket first-aid kit. Weighs slightly under 4 oz. Tin box holds 10 items,

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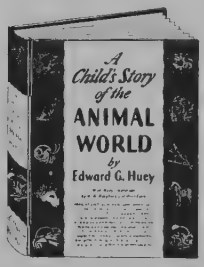

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CALIFORNIA SUGAR PINES

(Continued from page 364)

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(Continued on page 381)

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CALIFORNIA SUGAR PINES

(Continued from page 380)

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